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THE MARINERS NEW KALENDAR.

Containing

The Principles of Arithmetick and Geometry; with the Extraction of the Square and Cube Roots. Alſo Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the ſame.

Together with

Exact Tables of the Sun's Place, Declination, and Right Aſcenſion. Of the Right Aſcenſion and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverſe.

ALSO,

The Deſcription and Uſe of the Sea-Quadrant, Fore-Staff and Nocturnal. The Problems of Plain-Sailing and Aſtronomy, wrought by the Logarithms, and by *Gunter's* Scale. A Tide Table. The Courſes and Diſtances on the Coaſt of *Great Britain*, *Ireland*, *France*, &c. And the Soundings coming into the Channel. With Directions for ſailing into ſome Principal Harbours.

BY

NATHANIEL COLSON, *Student in the Mathematicks.*

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London: Printed for *Tho. Page*, and *William*, and *Fiſher Mount*,
at the *Poſtern* on *Tower-Hill.* 1724.
Where you may have all Sorts of Mathematical and Sea-Books.

To the Ingenious *Mariner*.

I *Here preſent thee with a* New Kalendar, *wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practiſed) but to make Things plain and practicable. Here is nothing obſcure or difficult, to diſcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainneſs (both of Matter and Method) as poſſible; and I aſſure thee were I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd bigneſs of the Volume. The* Contents *are as follow:*

The Principles of Arithmetick, *with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted* Navigation *before they have underſtood ſomething of it; the* Extraction of the Square and Cube Roots: *In all which I have endeavoured to apply the Examlpes to Sea Affairs. Some neceſſary* Geometrical Problems, *uſeful in* Navigation. *Directions for finding the* Prime, Epact, Moon's Age, *and the* Time of Full Sea *(both according to the Ordinary and a more accurate Way) with* Tables *for the ſame.*

Tables of the Sun's Place and Declination, with Directions and Examples of every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of London, *for which the ſaid Tables of Declination are callated. A Table of the Sun's Right Aſcenſion. A Table of the Right Aſcenſion and Declination of ſome of the principal Fixed Stars, with the uſe of the ſaid Tables in finding the Time of a Star's coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the* Sea-Quadrant, Fore-ſtaff *and* Nocturnal. *A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt collected from the beſt Information. Problems of* Plain Sailing *and* Aſtronomy, *which (that the* Practitioners *might learn two things at once) are wrought both by the* Logarithms, *and* Gunter*'s Scale. A large and very uſeful Table of Difference of* Latitude *and* Departure *to every Degree and Quarter Point of the Compaſs: With its uſe in working a Traverſe in order to keep a Reckoning at Sea. A Rutter for the Coaſt of* Great Britain, France, Ireland, Spain, Portugal, *&c. Shewing the Bearing and Diſtance from one Place to another. A Table of the* Soundings, *coming into the* Channel, *giving the Depth of Water, and Quality of the Ground.* Laſtly *Directions for ſailing into ſome principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayeſt, if thou wanteſt Information in any of theſe Things, and doſt but a little carefully animadvert upon what thou readeſt) I have my end: And thy kind Acceptance hereof will further Oblige me,*

Who am thy Friend

Nathaniel Colſon.

The Principles of Arithmetick briefly and plainly Demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedurecan be made, and firſt of

Numeration.

NUmeration is that part of *Arithmetick*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	*Two,*	*Three,*	*Four,*	*Five,*	*Six,*	*Seven,*	*Eight,*	*Nine,*	*Cypher.*

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to their Places they are ſet in; as 1 in the firſt Place, or Place of *Units*, is *One*; in the ſecond Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number*: As 123, which *Number* conſiſting of three Places, is thus numbred, *One Hundred Twenty Three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred, Twenty Three Thouſand, Four Hundred Fifty Six*; *One* this *Number* 123456789, conſiſting of nine Places, is thus numbred, and *Hundred Twenty Three Millions, Four Hundred Fifty Six Thouſand, Seven Hundred Eighty Nine.*

Addition is that which of ſeveral Sums makes but one Sum.

Example. Suppoſe four Men (A. B. C. D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole: I begin at the firſt row towards the Right Hand and ſay, 3 and 6 is 9 and 2 is 11, and 4 is 15: ſetting down the 5 under the row added up; then I carry the 1 ten to the next row, ſaying 1 and 4 is 5, and 5 is 10 and 3 is 13, and 6 is 19; ſet down 9 under the row added up, and carry 1 to the next row, ſaying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, ad 5 is 10, and 3 is 13; which becauſe this is the laſt row, I ſet down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thouſand, Nine Hundred, Ninety Five Pounds.*

	l.
A oweth	3564
B————	3432
C————	5156
D————	1843
	13995

Characters uſed in Arithmetick

l.	Pounds.
s.	Shillings.
d.	Pence.
o.	Degrees.
′	Minuets.
′′	Seconds.

Examp. 2. Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole.

Therefore begin again (as always in *Addition*) at the Right Hand, I ſay 11 and 10 is 21, and 4 is 25 and 6 is 31; now conſidering how many Shillings there are in 31*d* I find 2*s.* and 7*d.* wherefore I ſet down the odd 7*d.* under the row of Pence, and carry the 2 *s.* to the next row being Shillings, ſaying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1*l.* 14*s*, ſet down 14*s.* and carry the 1*l* to the next row, ſaying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; ſet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; ſet down 2 and carry 1: Laſtly, 1 and 1 is 2; ſo that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppoſe at Sea, keeping my Reckoning in Degrees and Minutes, having ſix Days difference of Longitude. I would know how much the whole is.

Say, 13 and 2 is 15, and 9 is 24, and 56 is 80, and 6 is 86; now 60 Minutes making a Degree, ſet down the odd 26 Minutes under the row of Minutes and carry the 1 Degree to the next row, being Degrees; ſaying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7. So that the whole Difference of Longitude made theſe 6 Days, is 7 Degrees and 26 Minutes.

	°	′
1 Day	1	06
2————	0	56
3————	1	09
4————	2	00
5————	1	02
6————	1	13
	7	26

Subtraction.

SUbſtraction is the taking of a leſs Sum out of a greater, ſubſtracting the Remainder

	l.	s.	d.
Example Suppoſe a Man oweth me	376	13	06
And hath paid me	211	05	08
I deſire to know what remains unpaid which is	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 1, I go to the next row, and ſay; 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3 there remains 1: So there remains due of the ſaid Debt, *One Hundred Sixty Five Pounds Seven Shillings Ten Pence.*

Example 2. Suppoſe the diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to Sail.

Therefore placing 396, under the 1000, I ſay, 6 from 0 I cannot but 6 from 10, there remains 4; proceeding to the next Figure, I ſay, 1 that I borrowed and 9 is 10; from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4; from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Miles
1000
396
604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 12 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, Subtract the leſs Latitude out of the greater thus; the leſſer being plac'd undermoſt, ſay, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but two from 11 there remains 9, then 1 that I borrowed and 4 is 5, 5 from 5 there remains 0. So the Difference of Latitude is 9 Deg. 22 Min.

°	'
51	32
42	10
09	22

Multiplication.

MUltiplication is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts.

1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The *Product* made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the Table which is firſt to be committed to Memory.

The Multiplication Table.

2 times	2 3 4 5 6 7 8 9	is	4 6 8 10 12 14 16 18
3 times	3 4 5 6 7 8 9	is	9 12 15 18 21 24 27.
4 times	4 5 6 7 8 9	is	16 20 24 28 32 36
5 times	5 6 7 8 9	is	25 30 35 40 45
6 times	6 7 8 9	is	36 42 48 54
7 times	7 8 9	is	49 56 63
8 times	8 9	is	64 72
9 times	9	is	81
10 times	10	is	100

Example 1. I demand how many Shillings there is in 5648 *l.*

To anſwer this, multiply the given Number of Pounds by 20, thus ; The firſt being o Cypher, ſet down o underneath the firſt Figures ; and then proceed to the next Figure, and ſay, 2 times 8 is 16 ; ſet down 6 under the ſecond Figure and carry 1 ; then 2 times 4 is 8, and 1 that I carried makes 9 ; then 2 times 6 is 12, ſet down 2, and carry 1 ; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648 *l.* multiply'd by 20, makes 112960 Shillings.

```
     l.
   5648
     20
 ------
 112960
```

Example. 2. In 276 Degrees how many Minutes ?

First ſet down —————————— 276

Then (becauſe 60 Minutes make a Degree) multiply by ——— 60

The Product is —————————— 16560

So that I find 276 Degrees multiplied by 60, make 16560 Minutes.

```
Example 3. Multiply ——— 8765437      Multiply ——— 47632867
By ———————————————————— 32           By ————————————— 4352
                   17530874                          95265734
                 2)6296311                          238164335
Product            280493984                       142898601
                                                  190531468
                                                  207298237184
```

Diviſion

Diviſion is that which ſerves in the room of many *Subtractions* and is uſeful in reducing all Numbers of a leſſer Denomination into a greater, as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, *(viz.) Dividend,* or the

Number to be divided; Diviſor, or the Number to divide by; and the Quotient, with the Remainder of Diviſion.

Ex. 1. To divide 7834 by 23; firſt ſay, how many times 2 in 7; Or how often 23 in 78; the Anſwer will be 3 times, which place in the Quotient; then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying 3 times 3 is 9, and 3 times 2 is 6, and place theſe under the two firſt Figures of the Dividend, and draw a Line; ſubtract 69 from 78 and there reſts 9, which ſet underneath, and place a Point under 3; to ſhew that it's brought down; place it to the 9, then proceed, ſaying, how many times 23 in 93, or how many times 2 in 9; which will be 4 times; place 4 in the Quotient, by which multiply the Diviſor; again, placing the Product which is 92 under 93 and draw a Line, and ſubtract it therefrom, the Remainder 1 put under the Line, and ſet down 4 the laſt Figure in the Dividend, putting a Point under it, and place it to the Remaining 1: Then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſor.) *Dividend.* (*Quotient.*
23) 7834 (340
69 · ·
93
92
14 Remains.

Ex. 2. In 360 Minutes, how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree, and becauſe the laſt Figure of the Diviſor is a Cypher, I cut it off, and with it the laſt Figure of the Dividend, which is here alſo a Cypher; and divide 36 by 6 (which is the ſame as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay, How many times 6 in 36? The Anſwer is 6 times: which I place in the Quotient, and proceed to multiply the Diviſor 6, by the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0. So that by this Work, it appears that in 360 Minutes there are 6 Degrees juſt.

Diviſor.) *Dividend.* (*Quotient.*
60) 360 (6
360
00

Ex. 3. A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's Share, being equally divided.

Diviſor.) *Dividend.*) *Quotient.*
253) 59875)236
506 · ·
927
759
1685
1518
167 Remains.

253
236
1518
759(7
506(6
(1
Proof 59875

Firſt, ſay, how many times 2 in 5? The Anſwer is two times, which place in the Quotient; then multiply the Diviſor 253 by 2, the Figure placed in the Quotient, ſaying 2 times 3 is 6, 2 times 5 is 10, ſet down 0, and carry 1; 2 times 2 is 4, and 1 is 5; which ſet down under the 3 firſt Figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and ſet it after 92 the Remainder; then ſay how often 2 in 9; Anſwer 3 times, (for 4 will prove too many. Then multiply the *Diviſor* 253. as before, by 3, the Figure laſt placed in the Quotient and the Product will be 759. which being ſubtracted from the Figures above the Remainder will be 168; then take down 4, and point it as before, ſetting it after 168, the laſt Remainder: And again ask the Queſtion, how often 2 is contained in 16? Anſwer 6 times; by which 6, when ſet in the Quotient, multiply the *Diviſor* 253; and the Product is 1518, which place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſhed, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may eaſily be done by multiplying 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor*, by 236 the Quotient; and taking in 167 the Remainder, under the three laſt Figures, the Product will make the ſame with the *Dividend*, as you ſee in the *Operation*.

The Rule of THREE.

IS that, which having three Numbers given, a forth Number is found in Proportion thereunto: which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſion is the Anſwer to the Queſtion.

Examp. 1. If in 24 Hours a Ship ſail 130 Miles: How many Miles will ſhe ſail with the ſame Gale in 192 Hours or eight days?

192
130
5760
192
24)24960(1040 Miles in 192 Hours.
24···
96
96
00

Here 24 is the firſt Number, 130 the ſecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960, by 24 the firſt Number, which gives in the Quotient 1040 Miles, which is the way the Ship will make in 192 Hours the time propoſed.

Examp. 2. If one lb. of Tobacco coſt 6*d.* what will 112 lb. coſt?

112
6
1)672 Pence (or 56 Shillings.)

Here the firſt Number being an Unit, which neither Multiplies nor divides, it ſaves the labour of Diviſion, and the Anſwer is 672 d. (for the Anſwer will be of the Name with the ſecond Number) which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 lb. as required.

Examp. 3. If a Staff of 3 Yards long give a Shadow of 2 Yards, How high is that Caſtle whoſe Shadow is 100 Foot?

Which Queſtion, for the more ready Solution, ſtate thus:

If 6 Foot (which is 2 Yards) give 9 Foot, What ſhall 100 Foot give?

By the Operation it appears, the ſaid Caſtle muſt be 150 foot high.

```
     9
6)900) 150 Foot.
  6..
  30
  30
  00
```

Examp. 4. If 564 *l.* 12 *s.* 6 *d.* is to be divided between 165 Men, How much is one Man's Share?

Firſt reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564 *l.* 12 *s.* 6 *d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but here it is 1 which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the five remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a farthing. *The Operation follows.*

```
      564 l. 12 s. 6 d.
      201
     11292
        12
     22590
     11292
165) 135510(821 Pence.        12 (821(68 Shillings.
     1320..                       72
       351                       101
       330                        96
       210                         6 Pence,
       165
        45
```

Note, That in the *Rule of Three*, the firſt and third Number muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein, as in the foregoing Example. I work not the Queſtion as it was firſt ſtated, but trancepoſing the Numbers, I put the Denomination of Men firſt and laſt, and the Money in the midſt, to anſwer to that part of the Rule, which requires the firſt and third Numbers to be both of one Name. The Anſwer thereof in the preceeding Queſtion, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68 *s.* and 5 *d.* or 3 *l.* 8 *s.* and 5 *d.* which is one Man's Share, which was required.

The next thing I ſhall briefly treat of, is, *The Extraction of the Square and Cube Roots*, as alſo ſomewhat of their Uſe.

The Extraction of the Square Root.

Example 1. TO extract the ſquare Root of 7056, proceed thus: Firſt point the given Numbers (that is, put a Prick) over every other Figure, beginning at the firſt Figure at the right hand, (and note by the way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Roots of the ſaid Numbers) then proceed, ſeeking the greateſt ſquare Number (which is a Number multiplied by it ſelf, in the firſt Point towards the Left-Hand (70) which is 64 conſtituted of 8 multiplied into it ſelf; for 8 times 8 is 64. The Root of the ſquare Number, which is 8, place in the Quotient, and ſubſcribe the ſquare Number 64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place it (*viz.* 16) therein, calling it the Diviſor, ſeek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right-Hand (*viz.*) How many times 16 in 64? The Anſwer is 4 times, which Place in the Quotient, and alſo on the Right-hand of the Diviſor (16) then multiply the Diviſor (164) by the 4 placed laſt in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom; which done, nothing remains. So that the Square Root of 7056 is 84.

```
      .  .
      7056(84 Root.
      64
   ----------
   164)656 Di.
       656
   ----------
       000
```

The Square Root is applied to Navigation as follows.

Any two ſides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppoſe a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required; the ſaid Diſtance is found by the Extraction of the Square Root, as follows.

The Rule Square the Difference of Latitude and Departure ſeverally (that is, multiply each by it ſelf) and from the Sum of both the Squares added together, extract the Square Root, which will be the Diſtance required.

Example.

Difference of Lat. is 87.	The Departure 71.	Square Diff. Lat. —7569
Multiplied by it ſelf 87.	Multip. by ſelf 71.	Square Depart. —— 5041
609	71	Sum 12610
696	497	
The Square —— 7569	The Square — 5041	

12610(112, the Diſtance required.
1
21)026
21
222) 510
444
66

By this Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

Examp. 2. Suppoſe a Ship's Diſtance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be required; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required

Example. The Diſtance ———— 111 ———— The Departure ——— 57
Multiplied by it ſelf - —— 111 —— multiplied by it ſelf —— 57
111   399
111   285
111   Sq. of Depart. ——— 3249

Square of the Diſtance ——— 12321
Square of the Depart. ſubſtract. 3240
Remains 9072

9072(95 Diff. Lat. required.
81
185)972
925
47

The difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the *Departure* be required, the Rule is, From the Square of the *Diſtance*, ſubtract the Square of the *Difference* of Latitude, and the Square Root of the Remainder is the *Departure* required. The Operation, for Brevity ſake is omitted.

Having proceeded thus far in ſhewing the *Practitioners* how to find the *Diſtance*, *Difference* of Latitude and *Departure* (any two of them being given) without *Trigonometry*, I ſhall ſhew the manner of finding the Courſe (exact enough for common Uſe) without the ſaid Operation, which is done as follows:

The Proportion to find the Courſe. As the Sum of the Hypothenuſe (or *Diſtance*) and half the greater of the other two Legs (*viz.*) if the *Difference* of Latitude be moſt, half that; but if the Departure be moſt, half that; I ſay; as the ſum of theſe two is in Proportion to the leſſer (or remaining) Leg, ſo is 86 to the Angle (in degrees) oppoſite to the leſs Leg; which is the Courſe, when the *Departure* is leſs than the *Difference* of Latitude, otherwiſe 'tis the Complement of the Courſe.

Example. Admit a Ship's *Diſtance* to be 110, the *Difference* of Latitude to be 88, and the *Departure 66*, and the Courſe required.

Firſt, Add the *Diſtance*, and half the greater Leg into one Sum.

The *Diſtance* is —— —— 110

Half the greater Leg (88) is —— —— 44

The Sum —— —— —— —— 154

Having thus done, ſay by the *Rule of Three.*

As the ſaid Sum 154 to *66* the leſſer Leg, ſo is 86 to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60, (the number of Minutes, contained in a degree) and divide the Product by the *Deviſor* (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minues: So that the Courſe required is 36 deg. 51. min.

66

516

516

154 5676(36 *deg.* 51 *min.*

462

1056

924

132

Example 3. *Extraction of the Square Root.* Suppoſe a Rope of 5 Inches Compaſs, and another Rope of double the Strength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root*: For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is four times the ſtrength of that of 5.

The Rule: Take the Compaſs of the given Rope (*viz.* 5) and multiply that by it ſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply it by 2, and the Square Root of the Product is the Compaſs of the Rope required.

Example. The given Rope's Compaſs 5 Inches Extract the Root 50 (7

Multiplied by it ſelf —— —— 5 49

The Square —— —— 25 1

Multiplied by —— —— 2

50

So that by the Operation it appears, a Rope to be twice the Strength of the given Rope of 5 Inches Compaſs, muſt be 7 Inches.

If it's deſired to know the weight of one Rope by another, 'tis as follows,

The Proportion is, As the Square of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the weight of the one to the weight of the other, Length for Length: *Ex.* ſuppoſe a Cable of 10 Inches to weigh 25 Hundred, and the weight of a Cable of 8 Inches required, Say, As 100 (the Square of 10) to 64 the Square of 8; ſo is 25 C. the weight of one Cable, to 16 C. the weight of the other required. *Ex-*

Extraction of the Cube Root.

I Shall firſt, as neceſſary, inſert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

Cubes of the Nine Digits.

1	001	4	064	7	343
2	008	5	125	8	512
3	027	6	216	9	729

Example 1. Extract the Cube Root of 12167.

Firſt, Point the given Number (*i. e.*) put a Prick over every third Figure) beginning at the Right Hand) then ſeek the greateſt Cube in the firſt Point (*viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend; then draw a Line underneath it, then ſquare the Quotient 2 which is 4, multiply the ſaid Square (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Tripple Square. Again multiply the Quotient (2) by 30 which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two (*viz.*) Triple Square and Triple Quotient, into one Sum and call it the *Diviſor*; ſeek how often this *Diviſor* is contained in the Reſolvend, which is three times; which three placed in the Quotient, multiply the Triple ſquare by the 3 laſt placed in the Quotient, and ſubſcribe the product underneath the *Diviſor*; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product; Cube the Figure (3) laſt placed in the Quotient, and place it under the preceeding Products. Laſtly, add theſe 3 Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder, had there been any more Figures, the next Point muſt have been brought down and the proceeding Work reiterated from the ſquaring of the Quotient, until all the Figures are ſo brought down; But in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23 juſt, nothing remaining.

$\dot{1}2\dot{1}67($23 Root.
8
4167 Reſolvend.
1200 Triple Square.
60 Triple Quot.
1260 Diviſor.
3600
540
27
4167
000

Examp. 2. *Applied.* Suppoſe a Ship of 300 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 foot deep in the Hold; and another Ship is deſired of the ſame Mould and Shape of 500 Tun. The ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root. *Example.* Beginning with the Keel: Firſt, Cube the length of the given Keel, which is done by multiplying it into it ſelf, and then multiplying the Product by it again.

Then ſay by the Rule of Three; As 300 Tun the one Ship's Burthen; to 500 Tun the other Ship's Burthen; ſo is 421875 the Cube of the one Ship's Keel's length, to the Cube of the other Keel's length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the ſame as if there had been more Figures in the propoſed Number; the Operation gives for the length of the Keel required 88 Foot, $\frac{2}{10}$ parts.

```
     75 given Keel
     75
   ------
    375
   525
   ------
   5625
     75
   ------
  28125
 39375
 ------
 421875 Cube given Keel
 ------

   .  .
 703125(88 ,2/10 Root.
 512
 ------
 191125 Reſolvend.
  19200  Triple Square,
    240 Triple Quotient.
 ------
  19440 Diviſor.
 ------
 153000
  15360
    512
 ------
 109472
  21653000 Reſolvend.
 ----------
  2323200 T. S.
     2640 T. Q.
 ----------
  2325840 Diviſor.
 ----------
 20908800
   213840
      729
 ----------
 21123369
   529631 Remainder.
 ----------
```

Thus, having found one of the Dimenſions, the reſt may be found without the Extraction of the Root, by the Rule of Three.

Thus, ſuppoſe the next thing I would find be her breadth by the Beam, ſay, As the length of the one Ship's Keel 75, is to the length of the other 89 *fere*; So 29 $\frac{1}{2}$ Foot, the breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot $\frac{3}{4}$. So you may find the Depth in the Hold, &c.

Example 3. Suppoſe an Iron Shot 4 Inches Diameter to weigh 9 lb. and the Diameter of a Shot whoſe weight is 72 lb. required. This is alſo done by the Extraction of the Cube Root as follows:

Firſt, ſay, by the Rule of Three.

As 9lb. the weight of one Shot, to 72lb. the weight of the other; ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter: which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

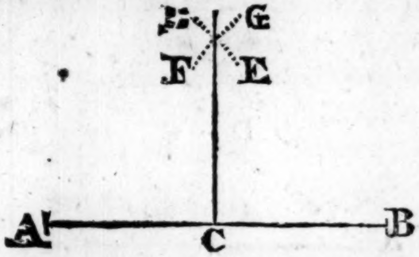
But if it were required to find the weight of a Shot by the Diameter, it's done thus, by the Rule of Three.

As the Cube of the one Shot's Diameter, to the Cube of the other; So is the weight of the one Shot, to the weight of the other required.

And thus much for the Arithmetical Part of this Treatiſe.

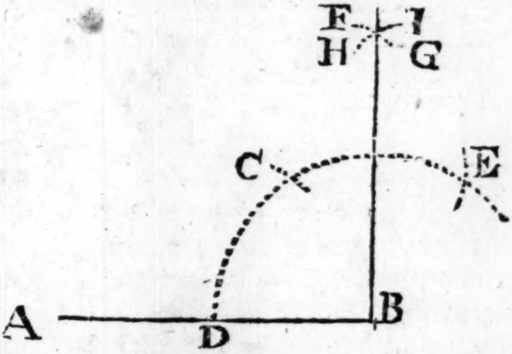
Some Neceſſary Geometrical Problems.

Problem I. *To raiſe a Perpendicular on the Middle of a Line.*



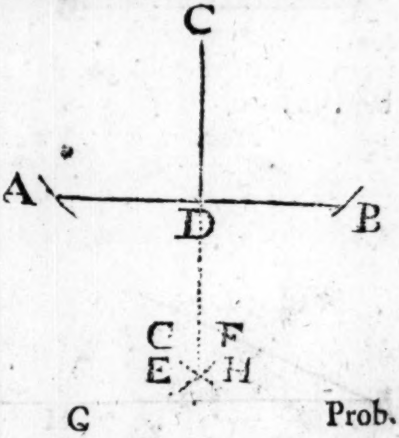
LET the Line given be AB, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances, CA and CB: Then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch DE; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, through the Interſection (or Cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*



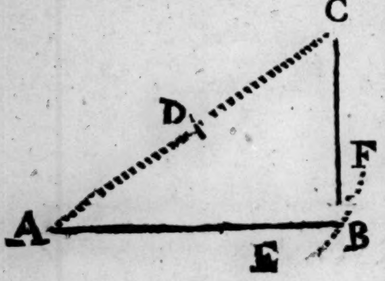
Let the Line given be AB, the Perpendicular to be raiſed from the Point B, to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E; then with the ſame Diſtance, one Foot of the Compaſſes being in the Point D, deſcribe the Arch FG; and placing the Compaſſes in the Point E, deſcribe the Arch HI; then from the point B, and through the Interſection of the two Arches FG and HI, draw the Perpendicular which was required.

III. *To let fall a Perpendicular from a Point aſſigned over the middle of a Line.*



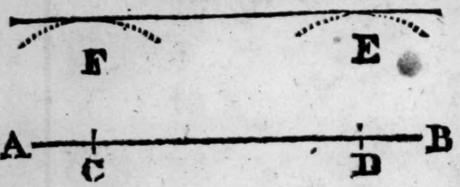
Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall, to do which, place one Foot of the Compaſſes in the Point C. then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with the foot of the Compaſſes in the Point A, deſcribe the Arch EF; and with one Foot in the Point B, deſcribe the Arch GH; then from the Point C, and by the Interſection of the ſaid two Arches, draw the Perpendicular CD which was required.

IV. *To let fall a Perpendicular from a Point given over the End of a Line.*



Let the Line given be AB, upon the end of which let it be required to let fall a Perpendicular from the Point C; to do which from the Point aſſigned C, draw the Line CA; which Line divided into two equal parts, as in the Point D, then one point of the Compaſſes reſting in the Point D, with the ſame diſtance (*viz.* of half the Line AC) deſcribe the Arch EF; then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular as was required.

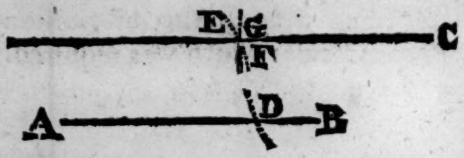
Prob. V. *To draw a Line Parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel; to do which, firſt take in the Compaſſes the diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F, then laying a Ruler to touch the Convexity of the two Arches, draw the Parallel as was required.

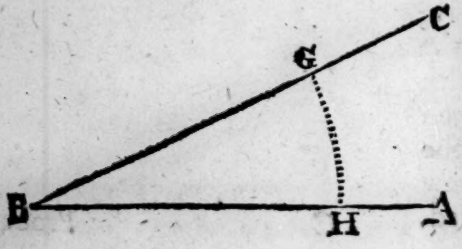
Prob. VI. *To draw a Right Line parallel to a given one, that ſhall paſs thro' a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line parallel thereto, that ſhall paſs thro' a given Point as C.



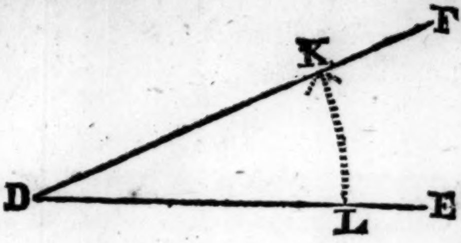
Set one Foot of the Compaſſes in C, with the other at any diſtance croſs AB in D, and with that diſtance from any Point, as A of the Line AB deſcribe an Arch EF; then from C with the diſtance AD croſs that Arch, ſuppoſe in G; the Line CG being drawn, ſhall be parallel to the given Line AB as was required.

Prob. VII. *To make an Angle equal to any given Angle*

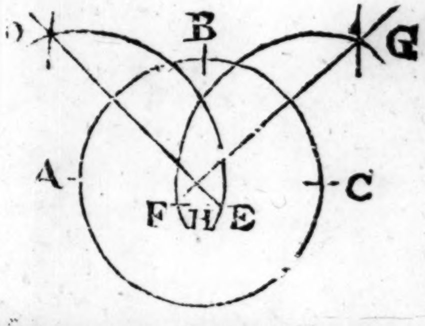


Suppoſe ABC an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line DE, then with any convenient Diſtance leſs than AB, deſcribe the Arch GH, then placing the Compaſſes at D, with the ſame diſtance which ſwept the Arch GH, ſweep the Arch KL;

then take the Length of the Arch GH in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then thro' the Point K draw the Line DF, then is the Angle EDF, equal to the Angle ABC as was required.



Prob. VIII. *To bring any Three Points not ſcituate in a right Line, into the Circumference of a Circle.*



Let the three Points thro' which the Circle is to paſs, be ABC: Take above half the Diſtance between the two Points A and B in the Compaſſes; and one Foot of the Compaſſes being in the Point A, with the ſaid diſtance deſcribe the Arch ED, and with the ſame Diſtance one Foot of the Compaſſes being in the Point B, mark the Arch ED in the points E and D, and draw the right Line ED; then take above half the Diſtance between the points C and B in the Compaſſes, and one foot of the Compaſſes being in the Point C, with the ſaid diſtance deſcribe the Arch FG; and with the ſame diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG in the Points F and G, and draw the Right Line FG. Now where the two right Lines DE and FG, being continued, interſect each other, (*viz.* in the point H) is the Center of the Circle, which was required.

The Deſcription of the Mariners Compaſs.

THIS Inſtrument ſo beneficially aſſiſtant to the Practical Part in Navigation, as to its Inventor, is uncertainly diſcours'd of; its Age, by ſome ſuppoſed to be in theſe Parts of the World, about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniences that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of greater or leſſer Diameter at Pleaſure, deſcribed upon a Paſte-board, and divided into 360 Degrees, and 32 Points, (and ſometimes into 24 Hours,) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

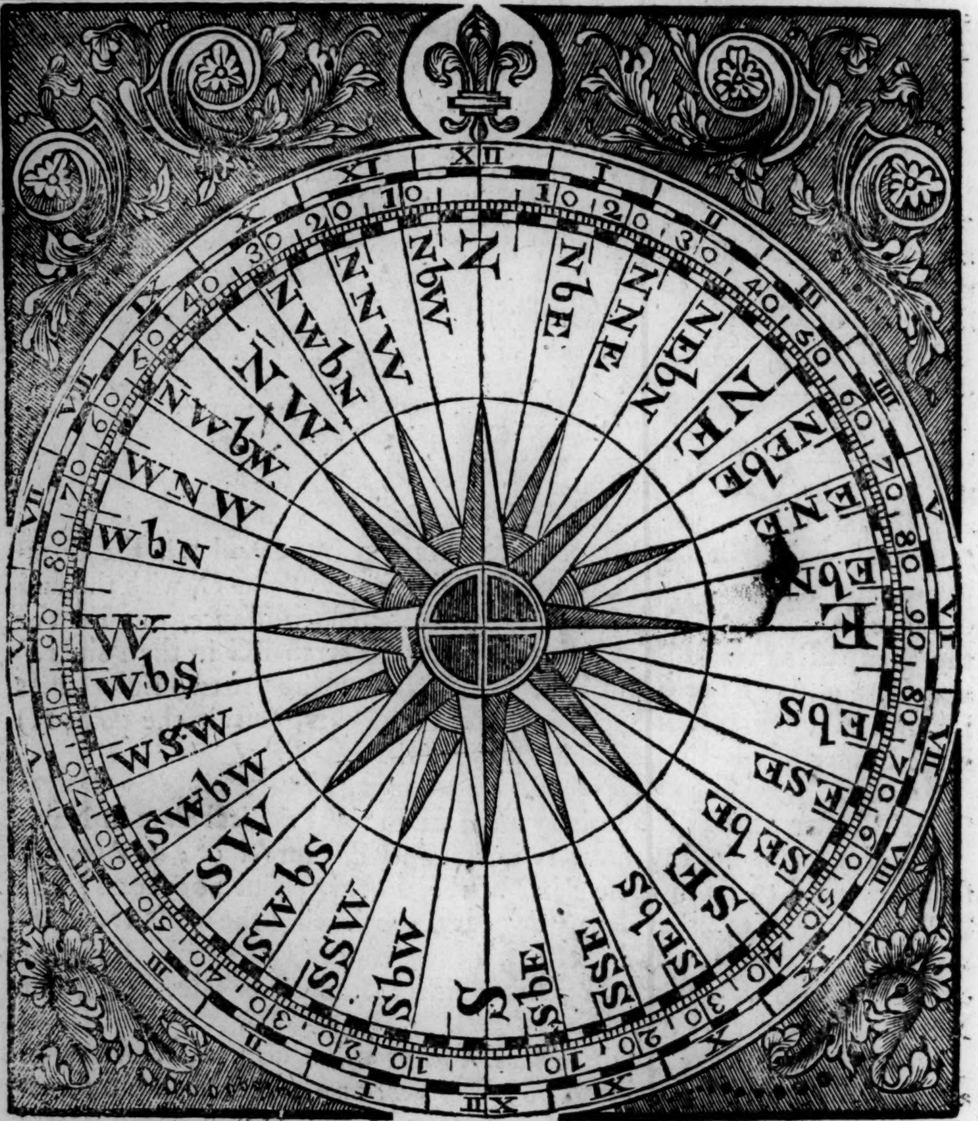
The Circle being thus divided upon the Chard, or Paſte-board, there are paſted on the other ſide of the ſaid Chard or Paſte board, two Wires, which Wires being touched with a Loadſtone, and the Chard hung at the Center, upon a Pin, fixed in a Box, its Poſition becomes North and South;

and

$\frac{4^{2}_{2}}{8\ 11}$

and the ſaid Box being covered with a Glaſs, and hung in another ſquare Box, to the end the Chard may traverſe notwithſtanding the Ship's Motion; being thus fixed, is ready for uſe.

The Figure of the Mariners Compaſs.



To find the Prime or Golden Number.

THE *Prime*, or *Golden Number*, is a Revolution of nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on nineteen Years before.

To find which add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number

Example. To find the *Golden Number* for the Year 1720, add 1, which makes 1721; which divide by 19.

19)1721(91
171
———
11

The Remainder 11 The Golden Number for that Year.

To ſind the Epact.

THE *Epact* is the Number of Days that the Solar Year of 365 Days exceeds the Lunar Year (or 12 Revolutions of the Moon to the Sun of 354 Days, the Difference being 11 Days: When the Golden Number is 1, the Epact is 11, when 2, the Epact is twice 11 or 22, when 3, thrice 11, or 33 rejecting 30) that is 3, &c. and it's thus found: Divide the Prime by 3, if 0 remain, the Epact is the ſame with the Prime, if 1 remain, add 10, if 2, add 20 to the Prime, the Sum (rejecting 30, if need be) is the Epact.

Example in the Year 1720, the Golden Number is 11, which divide by 3, there remains 2, therefore the Epact is 1.

In the Year 1722, the Golden Number is 13; which divide by 3, there remains 1; therefore 10 added to 13, makes the Epact 23.

In the Year 1725 the Golden Number is 16; which divide by 3. there remains 1; for which 10 added to the Golden Number 16, makes the Epact 26.

Or multiply the Golden Number by 11, and divide the Product by 30, the Remainder is the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required. Theſe three Sums added together, if leſs than 30 is the Moon's Age; if more than 30, take 30 from it as often as may be, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the Day of the Change. Again, 15 added to or ſubtracted from the Day of Change, leaves the Day of full Moon.

Example. Suppoſe it were required to find the Moon's Age for the fifth Day of *September* 1721.

Firſt ſet down the *Epact* for that Year ——— ——— 12
To which add the Number for the Month which is—08
To which add the Day of the Month, which is———05
Rejecting 30, gives the Moon's Age 25 Days.

Then out of 30,
Take ——— 25 The Moon's Age
Remains ——— 5 Days to the Change.
Add ——— 15
Makes ——— 20 Days to the Full-Moon.

To find the Moon's Southing by her Age, ſee in the Uſe of the Tide Table, which follows immediately after it.

To find the Dominical Letter.

TAKE the Year and it's fourth part, and add 4 to it; then divide the Sum by 7, and ſubſtract what remains from 7, the Remainder ſhews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe the Dominical Letter were required for the Year—— 1721
Firſt, ſet down the Year ——— ——— ——— ——— 1721
Then the 4th part, which omitting Fraction, is——— ——— 430
To which add ——— ——— ——— ——— ——— 4
2155
The Sum divided by ——— ——— ——— 7)2155(307
21
055
49
06

The Remainder after Diviſion is 6, which being ſubſtracted from 7, leaves 1; which ſhews it muſt be the 1ſt Letter, which is A the Dominical Letter for 1721 required. But when it is Leap Year, there are two Dominical Letters and then the Letter thus found ſerves from the laſt of *February*, to the end of the Year.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year 1721
Then add ——— ——— ——— 9
Divide by ——— ——— 28)1730(61
168
50
28
22

By the Operation it appears that 22 is the Cycle of the Sun for the Year 1721, being the Remainder after the Diviſion.

Note, *Hillary* Term begins *Jan.* 23, and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends 19 Days after.

Michaelmas Term begins *October* 23, and ends *November* 28.

A

A Table of the Moons Age for the Year 1721

M.		D.	H.
January.	Full moon.	02	03A
	Laſt quart.	10	04M
	New moon.	16	08A
	Firſt quart.	24	06M
February.	Full moon.	01	08M
	Laſt quart.	08	01A
	New moon.	15	09M
	Firſt quart.	23	04M
March.	Full moon.	02	10A
	Laſt quart.	09	08A
	New moon.	16	10A
	Firſt quart.	24	09A
April.	Full moon.	01	10M
	Laſt quart.	08	02M
	New moon.	15	00N
	Firſt quart.	23	03A
	Full moon	30	07A
May.	Laſt quart.	07	10M
	New moon.	15	03M
	Firſt quart.	23	05M
	Full moon.	30	02M
June	Laſt quart.	05	07A
	New moon.	13	06A
	Firſt quart.	21	06A
	Full moon.	28	08M
July.	Laſt quart.	05	06M
	New moon.	13	09M
	Firſt quart.	21	02M
	Full moon.	27	04A
Auguſt.	Laſt quart.	03	08A
	New moon.	11	11A
	Firſt quart.	19	08M
	Full moon.	26	01M
September.	Laſt quart.	02	01A
	New moon.	10	01A
	Firſt quart.	17	03A
	Full moon.	24	00N
October.	Laſt quart.	02	09M
	New moon.	10	03M
	Firſt quart.	16	09A
	Full moon.	24	03M
November.	Laſt quart.	01	06M
	New moon.	08	02A
	Firſt quart.	15	06M
	Full moon.	22	08A
	Laſt quart.	30	04A
December.	New moon.	08	01M
	Firſt quart.	14	05A
	Full moon.	22	02A
	Laſt quart.	30	05M

The Year 1721, hath ſix Eclipſes, 3 of the Sun, and 3 of the Moon.

The firſt will be an Eclipſe of the Moon, *Jan.* the 2d Day, inviſible. The ſecond will be of the Sun, on *Jan.* 16th. inviſible. The third will be of the Moon, on *June* 28th, inviſible. The fourth will be on *July* the 13th, about 9 in the Morning, wherein the Sun will be Eclipſed viſible 3 Digits. The fifth will be of the Sun, on *December* the 7th, inviſible. The ſixth will be of the Moon, on *December* 22d. part viſible.

A Table of the Moons Age for the Year 1722

M.		D.	H.
January.	New moon.	06	11M
	Firſt quart.	13	07M
	Full moon.	21	10M
	Laſt quart.	29	06M
February.	New moon.	04	09A
	Firſt quart.	11	11A
	Full moon.	20	04M
	Laſt quart.	27	04A
March.	New moon.	06	08M
	Firſt quart.	13	06A
	Full moon.	21	08A
	Laſt quart.	28	11A
April.	New moon.	04	07A
	Firſtquart.	12	01A
	Full moon.	20	08M
	Laſt quart.	27	05M
May.	New moon.	04	06M
	Firſt quart.	12	08M
	Full moon.	19	06A
	Laſt quart.	26	10M
June	New moon.	02	08A
	Firſt quart.	10	12A
	Full moon.	18	02M
	Laſt quart.	24	04A

M.		D.	H.
July.	New moon.	02	10M
	Firſt quart.	10	01A
	Full moon.	17	09M
	Laſt quart.	24	01M
Auguſt.	New moon.	01	02M
	Firſt quart.	08	11A
	Full moon.	15	05A
	Laſt quart.	22	01A
	New moon	30	05A
September.	Firſt quart,	07	10M
	Full moon.	14	01M
	Laſt quart.	21	06M
	New moon.	29	09M
October.	Firſt quart.	06	06A
	Full moon.	13	11M
	Laſt quart.	21	01M
	New moon.	28	12A
November.	Firſt quart.	05	01M
	Full moon.	11	12A
	Laſt quart.	19	11A
	New moon.	27	04A
December.	Firſt quart.	04	09M
	Full moon.	11	04A
	Laſt quart.	19	07A
	New moon.	27	03M

The Year 1722 hath four Eclipſes, 2 of the Sun, and 2 of the Moon.

The firſt will be an Eclipſe of the Sun, *June* the 2*d*, inviſible. The ſecond will be on *June* the 18*th*, about two in the Morning, wherein the Moon will be Eclipſed, viſible, 13 Digits. The third will be on *November* the 27*th*, about four in the Afternoon, wherein the Sun will be Eclipſed (partly viſible) 6 Digits. The fourth will be on *December* the 11*th*, wherein the riſing Moon will be Eclipſed, part viſible, 7 Digits.

A Table of the Moons Age for the year 1723.

M.		D.	H.	M.		D.	H.
January.	Firſt quart.	02	06A	*July.*	Full moon.	07	01M
	Full moon.	09	09M		Laſt quart.	13	06A
	Laſt quart.	18	10A		New moon.	21	02M
	New moon.	25	02A		Firſt quart.	29	06M
February.	Firſt quart.	01	06M	*Auguſt.*	Full moon.	05	09M
	Full moon.	09	03M		Laſt quar.	12	01M
	Laſt quart.	17	05M		New moon.	19	05A
	New moon.	23	11M		Firſt quart.	27	09A
March.	Firſt quart.	02	07A	*September.*	Full moon.	03	06A
	Full moon.	10	10A		Laſt quart.	10	10M
	Laſt quart.	18	06A		New moon.	18	10M
	New moon.	25	09M		Firſt quart.	26	09M
April.	Firſt quart.	01	11M	*October.*	Full moon.	03	02M
	Full moon.	09	03A		Laſt quart.	09	11A
	Laſt quart.	17	02M		New moon.	18	03M
	New moon.	23	07A		Firſt quart.	25	08A
May.	Firſt quart.	01	02M	*November.*	Full moon.	01	00N
	Full moon.	09	05M		Laſt quart.	08	04A
	Laſt quart.	16	08M		New moon.	16	09A
	New moon.	23	04M		Firſt quart.	24	06M
	Firſt quatt.	30	10A		Full moon.	30	12A
June.	Full moon.	07	04A	*Decemb.*	Laſt quart	08	01A
	Laſt quart.	14	01A		New moon.	16	02A
	New moon.	21	02A		Firſt quarr.	23	03A
	Firſt quart.	29	02A		Full moon.	30	02A

In this Year there will happen two Eclipſes only, and both of the Sun.

The firſt will happen on *May* the 23d Day. }
The ſecond on *November* the 16th Day. } Both Inviſible.

A Table of the Moons Age for the year 1724.

M.		D.	H.
January.	Laſt quart.	07	00N
	New moon	15	04M
	Firſt quart.	22	11A
	Full moon.	29	05M
February.	Laſt quart.	06	09M
	New moon	13	04A
	Firſt quart.	20	07M
	Full moon.	27	10A
March.	Laſt quart.	07	04M
	New moon.	14	03M
	Firſt quart.	20	06A
	Full monn.	28	04A
April.	Laſt quart.	05	04A
	New moon.	12	10M
	Firſtquart.	19	05M
	Full moon.	27	08M
May.	Laſt quart.	05	02M
	New moon.	11	05A
	Firſt quart.	18	06A
	Full moon.	26	11A
June.	Laſt quart.	03	09M
	New moon.	10	01M
	Firſt quart	17	11M
	Full moon.	25	00N

M.		D.	H.
July.	Laſt quart.	02	03A
	New moon.	09	10M
	Firſt quart.	17	04M
	Full Moon.	24	11A
	Laſt quart.	31	08A
Auguſt.	New moon.	07	09A
	Firſt quart.	15	10A
	Full moon	23	09M
	Laſt quart.	30	02M
September.	New moon.	06	11M
	Firſt quart.	14	02A
	Full moon.	21	06A
	Laſt quart.	27	10M
October.	New moon.	06	03M
	Firſt quart.	14	07M
	Full moon.	21	04M
	Laſt quart.	27	09A
November.	New moon.	04	11A
	Firſt quart.	12	09A
	Full moon.	19	02A
	Laſt quart.	26	00N
December	New moon.	04	05M
	Firſt quart.	12	10M
	Full moon.	19	01M
	Laſt quart.	26	08M

The Year 1724 hath four Eclipſes, 2 of the Sun, and 2 of the Moon.

The firſt will be an Eclipſe of the Moon, *April* the 27*th*. inviſible.

The ſecond will be on *May* the 18*th*, about 5 in the Afternoon, wherein the Sun will be Eclipſed viſible 11 Digits, and to the Northward it is Total.

The third will be on *October* the 21*ſt*, about 4 in the Morning, wherein the Moon will be Eclipſed 8 Digits.

The fourth will be an Eclipſe of the Sun, *November* the 4*th*. inviſible.

A Table of the Moons Age for the Year 1725.

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2

M.		D.	H.
January.	New moon.	03	11M
	Firſt quart.	10	06A
	Full moon.	17	01A
	Laſt quart.	25	04M
February.	New moon.	02	03M
	Firſt quart.	09	03M
	Fullmoon.	6	02M
	Laſt quart.	24	03M
March.	New moon.	03	04A
	Firſt quart.	10	10M
	Full moon.	17	05A
	Laſt quart.	25	09M
April.	New moon.	02	02M
	Firſtquart.	08	05A
	Full moon.	16	09M
	Laſt quart.	24	11M
May.	New moon.	10	10M
	Firſt quart.	08	02M
	Full moon.	16	01M
	Laſt quart.	24	01M
	New moon	30	05A
June	Firſt quart.	06	01A
	Full moon.	14	04A
	Laſt quart.	22	10M
	New moon.	28	12A
July.	Firſt quart.	06	02M
	Full moon.	14	06M
	Laſt quart.	21	05A
	New moon.	28	08M
Auguſt.	Firſtquart.	04	05A
	Full moon.	12	09A
	Laſt quart.	19	10A
	New moon.	26	06A
September.	Firſt quart.	03	11M
	Full moon.	11	07M
	Laſt quart.	18	04M
	New moon.	25	07M
October.	Firſt quart.	03	08M
	Full moon.	10	07A
	Laſt quart.	17	00N
	New moon.	24	11A
November.	Firſt quart.	02	03M
	Full moon.	09	06M
	Laſt quart.	16	02M
	New moon.	23	05A
December.	Firſt quart.	02	08A
	Full moon.	08	04A
	Laſt quart.	15	11M
	New moon.	23	00N
	Firſt quart.	31	11M

The Year 1725 *hath ſix Eclipſes, four of the Sun, and two of the Moon*

Of which, only one of the *Moon* will be viſible to us, it will be a Total Eclipſe, *October* 10*th*, between 6 and 7 at Night; Digits Eclipſed 21. It will be worth Obſervation.

A Table of the Moons Age for the year 1726.

M.		D.	H.
January.	Full moon.	07	02M
	Laſt quart.	14	02M
	New moon	22	07M
	Firſt quart.	29	10A
February.	Full moon.	05	01A
	Laſt quart.	12	09A
	New moon	20	12A
	Firſt quart.	28	06M
March	Full monn.	07	01M
	Laſt quart.	14	05A
	New moon.	22	02A
	Firſt quart.	29	01A
April.	Full moon.	05	01A
	Laſt quart.	13	00N
	New moon.	21	02M
	Firſtq uart.	27	06A
May.	Full moon.	05	02M
	Laſt quart.	13	05M
	New moon	20	11M
	Firſt quart.	27	01M
June.	Full moon.	03	04A
	Laſt quart.	11	08A
	New moon.	18	06A
	Firſt quart.	25	09M
July.	Full Moon.	03	07M
	Laſt quart.	11	08M
	New moon.	17	12A
	Firſt quart.	24	08A
Auguſt.	Full moon.	01	11A
	Laſt quart.	09	05A
	New moon.	16	08M
	Firſt quart.	23	09M
	Full moon.	31	02A
September.	Laſt quart.	08	01M
	New moon.	14	05A
	Firſt quart.	22	04M
	Full moon.	30	05M
October.	Laſt quart.	07	08M
	New moon.	14	04M
	Firſt quart.	21	11A
	Full moon.	29	07A
November.	Laſt quart.	05	03A
	New moon.	12	06A
	Firſt quart.	20	09A
	Full moon.	28	08M
December	Laſt quart.	04	12A
	New moon.	12	00N
	Firſt quart.	20	11A
	Full moon.	27	07A

The Year 1726 hath four Eclipſes, two of the Sun and two of the Moon.

The firſt will be an Eclipſe of the Sun *March* 22d. Inviſible.

the ſecond will be of the Moon, on *April* the 5th, Inviſible.

the third will be on *September* the 14th, wherein the Sun will be Eclipſed 7 Digits.

The fourth will be on *September* the 30th, wherein the Moon will be Eclipſed 6 Digits.

A Table of the Moons Age for the Year 1727.

M.		D.	H.
January.	Laſt quart.	31	10M
	New moon.	11	07M
	Firſt quart.	19	10M
	Full moon.	26	05M
February.	Laſt quart.	01	12A
	New moon.	10	01M
	Firſt quart.	17	10A
	Full moon.	24	03A
March.	Laſt quart.	03	02A
	New moon.	11	08A
	Firſt quart.	19	09M
	Full moon.	26	01M
April.	Laſt quart.	02	08M
	New moon.	10	11M
	Firſtquart.	17	05A
	Full moon.	24	11M
May.	Laſt quart.	02	03M
	New moon.	09	12A
	Firſt quart.	16	10A
	Full moon.	23	10A
	Laſt quart.	31	07A
June	New moon.	08	09M
	Firſt quart.	15	03M
	Full moon.	22	10M
	Laſt quart.	30	00N
July.	New moon.	07	05A
	Firſt quart.	14	08M
	Full moon.	21	11A
	Laſt quart.	30	08M
Auguſt.	New moon.	06	01M
	Firſtquart.	12	04A
	Full moon.	20	03A
	Laſt quart.	28	03A
September.	New moon.	04	08M
	Firſt quart.	11	04M
	Full moon.	19	08M
	Laſt quart.	27	02M
October.	New moon.	03	06A
	Firſt quart.	10	08A
	Full moon.	19	01M
	Laſt quart.	26	00N
November.	New moon.	02	05M
	Firſt quart.	09	03A
	Full moon.	17	05A
	Laſt quart.	24	08A
December.	New moon	01	05A
	Firſt quart.	09	01A
	Full moon.	17	08M
	Laſt quart.	24	04M
	New moon.	31	08M

The Year 1727 *hath two Eclipſes, and both of the Sun.*

The firſt will be on *March* the 11*th*, Inviſible.

The ſecond will be on *September* the 4*th*, viſible 3 digits.

A Table of the Moons Age for the year 1728.

M.		D.	H.
January.	Firſt quart.	08	10M
	Full moon.	15	08A
	Laſt quart.	22	01A
	New moon.	03	02M
February.	Firſt quart:	07	06M
	Full moon.	14	07M
	Laſt quart.	20	11A
	New moon.	28	08A
March.	Firſt quart.	07	10A
	Full moon.	14	05A
	Laſt quart.	21	11M
	New moon.	29	01A
April.	Firſt quart.	06	10M
	Full moon.	13	01M
	Laſt quart.	20	01M
	New moon.	28	05M
May.	Firſt quart.	05	05A
	Full moon.	12	09M
	Laſt quart.	19	03A
	New moon.	27	07A
June.	Firſt quatt.	03	11A
	Full moon.	10	06A
	Laſt quart.	18	09A
	New moon.	26	06M
July.	Firſt quart.	03	05M
	Full moon.	10	04M
	Laſt quart.	18	03M
	New moon.	25	04A
Auguſt.	Firſt quart.	01	10M
	Full moon.	08	05A
	Laſt quar.	16	08A
	New moon.	24	01M
	Firſt quart.	30	05A
September.	Full moon.	07	08M
	Laſt quart.	15	00N
	New moon.	22	10M
	Firſt quart.	29	02M
October.	Full moon.	07	02M
	Laſt quart.	15	02M
	New moon.	21	07A
	Firſt quart.	28	04A
November.	Full moon.	05	08A
	Laſt quart.	13	02A
	New moon.	20	05M
	Firſt quart.	27	09M
Decemb.	Full moon.	05	02A
	Laſt quart	13	01M
	New moon.	19	05A
	Firſt quart.	27	06M

The Year 17[illegible] *hath four Eclipſes, two of the Sun and two of the Moon.*

The firſt will be an Eclipſe of the Moon, *February* the 14*th*, viſible 10 Digits.
The ſecond will be an Eclipſe of the Sun, *February* the 28*th*, inviſible.
The third will be an Eclipſe of the Moon, *Auguſt* the 8*th*, inviſible.
The fourth will be an Eclipſe of the Sun, *Auguſt* the 23*d*, inviſible.

A Table o the Moons Age for the year 1729.

M.		D.	H.	M.		D	H.
January.	Laſt quart.	03	10A	*July.*	Laſt quart.	06	11A
	New moon.	01	04A		New moon.	15	02M
	Firſt quart.	18	06A		Firſt quart.	22	7M
	Full moon.	26	05M		Full moon.	29	01M
February	Laſt quart.	01	10A	*Auguſt.*	Laſt quart.	05	04A
	New moon.	09	10M		New moon.	13	02A
	Firſt quart.	17	02A		Firſt quarr.	20	01A
	Full moon.	24	04A		Full moon.	27	01A
March.	Laſt quart.	31	07M	*September.*	Laſt quart.	04	11M
	New moon.	11	03M		New moon.	12	01M
	Firſt quart.	19	06M		Firſt quart.	18	02A
	Full moon.	26	01M		Full moon.	26	03M
April.	Laſt quart.	01	07A	*October.*	Laſt quart.	04	06M
	New moon.	09	08A		New moon.	11	11M
	Firſt quart.	17	06A		Firſt quart	18	03M
	Full moon.	24	09M		Full moon.	25	07A
May.	Laſt quart.	08	08A	*November.*	Laſt quart.	02	11A
	New moon	16	10A		New moon.	19	10A
	Firſt quart.	24	06A		Firſt quart.	16	02A
	Full moon.	31	08M		Full moon.	24	02A
June.	Laſt quart.	07	08M	*December.*	Laſt quart.	02	03A
	New moon.	15	00N		New moon.	09	07
	Firſt quart.	23	01M		Firſt quart.	16	05
	Full moon.	29	04A		Full moon.	24	10

In the Year 1729 there will happen four Eclipſes, two of the Sun, and two of the Mo

The firſt will be an Eclipſe of the Moon, *February* the 24*th*, Inviſible.
The ſecond will be of the Sun, on *March* the 10*th*, Inviſible.
The third will be of the Sun, on *July* the 14*th*, Inviſible.
The fourth will be of the Moon, on *July* the 28*th*, viſible and Total.

The Uſe of the foregoing Table of the Moon'*s Age.*

IN the ſaid Table the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months: in the firſt Column of each half, towards the left Hand, are the Months, in the ſecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the ſaid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A ſignifying Afternoon. M Morning. At the Bottom of the Tables are the Eclipſes for the reſpective Years.

The Uſe of this Table is, readily by inſpection, to find the Day, Hour, and Minute of the New, Full, or Quarters of the Moon.

Example 1. Suppoſe it were deſired to find the time of New Moon, *Jan.* 1721: Firſt, look for the Year 1721 on the Top of the Leaf, which having found, look for *January* in the firſt Colum towards the lett Hand; then in the next Column in the ſame Month is found New Moon; and in the two following Columns againſt New Moon, ſtands 16 : 08 : A. which ſhews that the New Moon in *January* 1721 is the 16th Day 08 Afternoon. The ſame Directions ſerve for the Full Moon, or firſt and laſt Quarters.

To find the *Moon*'s Age, ſubtract the Day of the Change or New Moon from the Day propoſed, the Remainder is the *Moon*'s Age. Supppoſe therefore it were required to find the *Moon*'s Age on *March* the 29, 1721.

Looking in the Year 1721, the Table gives the New Moon, to be on the 16th Day, therefore 16 being ſubtracted from th, there remains 13, whereby it appears the Moon is 13 Days old on the 29th of *March*.

Example 2. Suppoſe it were required to find the *Moon*'s Age on the 6th of *June*, 1721.

The laſt New Moon before *June* 6th, was *May* 15th; but becauſe you cannot take 15 from 6 you muſt add 31 (the Number of Days in *May*) and from the Sum 37, ſubtract 15, the Remainder 22 is the *Moon*'s Age required.

A Tide Table for the Sea-Coaſts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what* Moon *makes Full-Sea, upon the Full and Change-Days, at the places following, in Alphabetical Order.*

A	H.	M.
AT *Army*, N.N.E. and S.S.W.	01	30
At *Amſterdam*, and *Armentiers*, N.E. and S.W.	03	30
At *Abarwark*, E. N. E. and W.S.W.	00	30
At *Abermorick*, and *Antwerp*, Eaſt and Weſt	06	00
At *Alborough*, S.E. by S. and N.W. by N.	09	45

At

B	H.	M.
At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, N. and S.	12	00
Thwart of *Beachy* in the *Offing* N. by E. and S. by W.	12	45
At *Blackneſs* in *Bluet*, at *Bell Iſle*, N.N.E. and S.S.W.	01	30
Without *Bluet*, and at *Berwick*, N.E. by N. & S.W. by S.	02	15
The River of *Bourdeaux*, the South Coaſt of *Britaigne*, the Coaſt of *Biſcay*, and at *Boekneſs*, N.E and S.W.	03	00
At *Breſt*, before the *Baſs*, the River of *Bourdeaux* within the Haven, N.E. by E and S. W. by W.	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, E.N.E. and W.S.W.	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, Eaſt and Weſt.	06	00
At *Briſtol* Key, E by S. and W. by. N.	06	45
At *Bridgwater*, E.S E. and W.N.W.	07	30
Bulleyn deep, S.S.E.&N.N.W.	10	30
C		
In the *Condado*, N. and S.	12	00
In the *Chamber* of *Rye*, N. by E. and S. by W.	12	45
Without *Calice*, at *Corpus Chriſti* Point, before and at *Camfer*, N.N.E. and S.S.W.	01	30
Between *Calice* and *Dover*, before *Conquet*, and at the *North Cape*, N.E. and SW.	03	00
At *Cork*, *Calice*, *Cape Clear*, and in the *Creek*, E.N E. &W.S.W.	04	30
At *Caldy*, and in the Bay of *Carnarvan*, E. by N. & W. by S.	05	15
At *Concalo*, Eaſt and Weſt.	06	00
Without the *Caskets*, in the Channel S.E. by E. and N.W. by W.	08	15

	H.	M
Between *Guernſey* and the *Caskets*, before *Cromer*, before the *Caskets* and *Guernſey*, at *Seven clifts*, and at *Catneſs*, S.E. and N.W.	09	00
At the *Caskets*, and at *Chamberneſs*, S.E. by S. & N.E. by N.	09	45
At *Cows*, in the *Foſs* of *Caen*, in *Calice* Road, and in *Chamberneſs*-Road, S.S.E. and N.N.W.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripple-Sand* and the *Creyl*, and at *Culbot*, S. by E. and N. by W.	11	15
D		
At *Dover-Peer*, and before *Dunkirk*, North and South	12	00
At *Denbeigh* and *Downs* in the Road, N.E. by N. & S.W. by S.	02	15
At *Dort*, N.E. and S W.	02	00
At *Dungervan*, E.N.E. and W.S.W.	04	30
At *Dartmouth*, Eaſt and Weſt	06	00
At *Dublin*, S.E. by E. and N.W. by W.	08	15
At *Dunbar*, S.E. and N.W.	09	00
At *Dungeneſs* and *Dunnoſe*, S.E. by S. and N.W. by N.	09	45
At *Dover*, *Diep*, and in the *Downs* a ſhoar, S.S.E. and N.N.W.	10	30
E		
At *Emden*, before the *Elve*, before the *Eyder*, and before *Enchuſan*, North and South.	12	00
At *Edam*, N.N.E. and S.S W.	04	30
Before the Eaſtern and Weſtern *Emes*, and at *Egmongs*, S.E. and N.W.	09	00
F		
On the Coaſt of *Flanders*, North and South	12	00
At *Fluſhing*, N. by E. and S. by W.	12	45

	H.	M.
Before the *Fen*, in the Channel, N.N.E. and S. S. W.	01	30
Without *Fountney*, N. E. by N. and S. W. by S	02	15
Without the Banks of *Flanders*, N. E. and S. W.	03	00
At *Flamborough* and *Bridlington*, E.N.E. and W.S W.	04	30
At the *Forn*, in *Foy*, at *Falmouth* E. by N. and W. by S.	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, E. by S. and W. by N.	06	45
Before the Coaſt of *Frizeland* and the *Fly*, E. S. E. and W. N. W.	07	30
Without the *Fly*, S.E. by E. and N. W. by W.	08	15
At *Frize*, and *Fair-Iſle*, NW. and S E.	09	00
At the *Frith*, and at the *South-Foreland*, SSE. and NNW.	10	30
In *Fair-Iſle* Roads, and at the *North Foreland*, South by Eaſt and North by Weſt	11	15
G		
In the Road of *Gibralter*, at *Graveling*, and before *Cherburg*, North and South	12	00
Before *Goeree*, at *Guernſey*, and at *Graveſend*, NNE. and SSW.	01	30
At *Groy*, at *Gaſcoign*, and the Coaſt of *Galicia*, North Eaſt and South Weſt	03	00
Between *Guernſey* and *Caskets*, South Eaſt and North Weſt	09	00
Thwart of *Guernſey* in the Channel, S E. by S. and N. W. by N.	09	45
In the *Chamber* and *Goeree-end*, S by E. and N. by W	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton-Key*, N. and S	12	00
Under *Holy Iſland*, and at *Horn*, NNE. and SSW	01	30
Before *Hartlepool*, N. E. and S W	03	00
At *Huntcliff-foot*, NE. by E. and SW. by W	03	45
At *Humber*, E. by N. & W by S	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber*'s Mouth, Eaſt and Weſt	06	00
At *Harlem*, *Havre de Grace*, and *Home-head*, S. E. and N W.	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich*, SSE. and NNW	10	30
At *Harwich* within, S. by E. and N. by W	11	15
I		
At *Jutland-Iſlands*, N. and S.	12	00
On the Weſt Coaſt of *Ireland*, NE. and SW	03	00
In all the Havens on the South Coaſt of *Ireland*, E. by N. and W. by S	05	15
K		
Kentiſh Knock, N. and S.	12	00
At *Kelliers*, N. E. and S. W.	03	00
At *Kingſale*, ENE. & WNW.	04	30
At *Kilduyn*, ESE. and W.S. W	07	30
At *Kildive*, S E. and NW	09	00
L		
At *Leith*, N. and S	12	00
At *Liſbon*, N. E. by N and SW. by S	02	15
At *London*, NE. and SW	03	00
Thwart of *Londey*, and before *Lin*, E by N. and S by W.	05	15
At *Lin*, half Tide at *Londey*, Eaſt and Weſt	06	00
At *Lin*, E. by S. and W. by N.	06	45

At

	H	M
At the *Lizard* by the Land, E.S.E. and W.N.W.	07	30
At *Lambay*, S.E. by E. and N.W. by W.	08	15
At *Leyſtaff*, and thwart of it without the Banks, S.E. by S. and N.W. by N.	09	45
In *Leyſtaff* Road and at *Long-ſand-head*, S.S.E. and N.N.W.	10	30
M		
Within the *Maes*, at *Maldon*, N. by E. and S by W.	12	45
Before the *Maes*, N.N.E. and S.S.W.	01	30
At the *Maes*, and before St. *Matthews* Point, N.E. by E. and S.W. by W.	03	45
In *Mouſehole*, at St. *Matthews*, and within *Mounts-bay*, E.N.E. and W.S.W.	04	30
In *Milford*, at *Moonleſs*, at St. *Maloes*, E. by N. and W. by S.	05	15
Between *Mouſehole*, and *Falmouth*, and in *Milford*-Haven, E.S E. and W.N.W.	07	30
In St. *Magnes-ſound*, and at *Magnels* Caſtle, S.E. by E. and N.W. by W.	08	15
At the *Iſle of Man*, S.E.&NW.	09	00
Before *Margate*, S. by E. and N. by W.	11	15
N		
At *Newport*, half Tide N.&S.	12	00
At the Weſt end of the *Nower*, N. by E. and S. by W.	12	45
Before the River of *Nantz*, N.E. and S W.	03	00
At *Newcaſtle*, E. by N.&W. by S.	05	15
Before St. *Nicholas*, Eaſt by South and Weſt by North	06	45
At the *Needles*, at the *Iſle of Wight*. S.E. by E and NW. by W.	08	15
All the Coaſt of *Normandy*, and *Picardy*, S.S.E. and N.N.W.	10	30
Between the *Naze* and *Warhead of Lower*, S. by E. &N. by W.	11	15
O		
At *Orkneſs*, N.E. and S.W.	03	00
At *Orkney*, S.E. and N.W.	09	00
At *Orfordneſs*, S.E. by S. and N.W. by N.	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell-Waves*, S.S.E.&N.N.W.	10	30
At *Orfordneſs*, within the Sands, S. by E. and N. by W.	11	15
P		
At *Portſmouth*, Half-Tide, North and South	12	00
At the *Pens*, *Porthus*, and *Poictu*, N.E. and S.W.	03	00
On the Coaſt of *Portugal*, N.E. by E. and S.W. by W.	03	45
In *Plymouth*, and before St. *Pauls*, E. by N. and W. by S.	05	15
At St. *Paul's* in the Haven, Eaſt and Weſt	06	00
Before *Podeſſemek*, E. by S. and W. by N.	06	45
Thwart of *Plymouth*, E.S.E. and W.N.W.	07	20
At the *Race of Portland*, S.E. and N.W.	09	00
Q		
At *Quinborough*, N. and S.	12	00
R		
At *Rocheſter*, N. by E. and S. by W.	12	45
At *Ramkins*, N.N.E.&S.S.W.	01	30
At *Rotterdam*, in *Robin Hoods* Bay, and from the Race to the *Pole-head*, N.E. and S.W.	03	00
At *Rouen*, and before *Rochel*, N E. by E. and S.W. by W	03	45
In *Ramſey*, E. by N.&W. by S.	05	5
S		
In the *Sleve*, between *Uſhant* and *Scilly*, at the *Shooe*, at the		

	H	M
Spits, at *South-Hampton*, and along the *Swin*, N. and S.	12	00
Upon the Coaſt of *Spain*, and in *Shetland*, N.E and S W.	03	00
At *Scilly*, in the *Sound Scarbrough* &at *Staples* NE. by E. &SW. by W	03	45
At 7 *Iſles*, without the Haven in the broad *Sound*, E.N.E. and W.S.W.	04	30
At the Mouth of *Severn* betwen *Scilly* & the *Lizard*, at the *Spurn* &*Stockton*, E. by N. and W. by S.	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E. and W.	06	00
At *Sedmouth*, and at the *Start*, E. by S. and W. by N.	06	45
Off the *Start* in the Channel, E.S.E. and W.N.W.	07	30
Within the *Seyn*, and before *Shelbergh*, & at 7 *Clifts*, SE. & NW	09	00
At *Shoram*, SE. by S. & NW by N.	09	45
At *Seyn-head*, SSE. & NNW.	10	30
T		
Within *Tervere*, N. by E. and S. by W.	12	43
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, N.N.E. and S.S.W.	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, N.E. and S. W.	03	00
At the Clifts of the *Texel*, E.N.E. and W.S.W.	04	30
In *Torbay*, and before the *Texel*, E and W.	06	00
In the Road of the *Texel*, E.S.E. and W.N.W.	07	30
At *Tergon*, S.E. by S. and N.W. by N.	09	45
U		
Before *Urek*, N. and S.	12	00
At *Uſe*, N.E. and S.W.	03	00
Between *Uſhant*, and the Main, N.E. by E. and S.W. by W.	03	45
In the *Vourd*, at the Bay, within *Uſhant*, E.N.E. and W.S.W.	04	30
Without *Uſhant*. E. and W.	06	00
St. *Vallery*, S.S.E. and N.N.W.	10	30
W		
At *Windchelſey*, N. by E. & S. by W	12	45
At the *Weilings*, and from the Weſt end of the *Wight*, N.N.E. and S.S.W.	01	30
Before the *Weilings*, N.E. by N. and S W. by S.	02	15
At *Whitby*, N.E. and S.W.	03	00
In the Sea of *Wales*, and *Severn*, E N.E, and W.S.W.	04	30
In *Wales*, E. by N. & W. by S	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E. and W.	06	00
At *Weymonth* Key, E. by S. and W. by N.	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, E.S.E. and W.N.W.	07	30
Thwart of the *Iſle* of *Wight*, in the Channel, all within the *Iſle of Wight*, between the *Iſle of Wight*, and *Beachy*, by the ſhore, S.E. by E. and N.W. by W.	08	15
At the Eaſt end of the *Wight* and on *Wieringhen* Flats, S E. and N.W.	09	00
Y		
Before *Yarmouth*, N.N.E. and S.S.W.	01	30
At *Youghall*. E. N. E. and W.S.W.	04	30
At *Yarmouth*, S.E. by E. and N.W. by W.	08	15
In *Yarmonth Road*, in *Yarmouth*-Haven, S.S.E. and N.N.W.	10	30
Z		
On the Coaſt of *Zealand*, N.N.E: and S.S.W.	01	30
In the *Zerick-ſea*, N.E. & S.W.	03	00

THE

The uſe of the Tide Table.

THE foregoing Table ſhews the Time of Full Sea at the ſeveral Places therein mentioned, upon the Full and Change days of the Moon, which for more ready Uſe is put in Alphabetical Order.

Example. Admit the Time of Full-Sea at *London*, upon the Full and Change-days required.

Look into the Table under the Letter (L) it is found to flow at *London* North Eaſt and South-Weſt; that is, when it is Full-Sea at *London* upon the Full and Change-days of the Moon will be, as 'tis vulgarly ſaid, upon the North-Eaſt and South-Weſt points of the Compaſs, which, as the Compaſs ſhews, it is 3 Hours.

The Uſe of this, together with the Moon's Southing, to find the Time of full Sea at any Time, at any of the ſaid Places, ſhall be ſhewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4. and divide the Product by 5. and the Quotient of the Diviſion is the Time of Southing.

Note, If the Moon's Age exceed 15, reject the ſaid 15. and take the Remainder, with which proceed inſtead of the Moon's Age.

Example. Suppoſe the time of the Moon's Southing be required on the 28th of *June*, 1719. The Moon's Age will be found to be 22 days, rejecting 15. the Remainder is 7; which multiplied by 4, makes 28, which divided by 5. gives in the Quotient 5 Hours 36 minutes, which is the time of the Moon's Southing, which was required.

Note, Every one that remains after Diviſion, is 12 Minutes.

I ſhall here add a Table of the Moon's Southing to every day of her Age.

Moon's Age.		Southing. H.	M.
01	16	00	48
02	17	01	36
03	18	02	24
04	19	03	12
05	20	04	00
06	21	04	48
07	22	05	36
08	23	06	24
09	24	07	12
10	25	08	00
11	26	08	48
12	27	09	36
13	28	10	24
14	29	11	12
15	30	12	00

The Uſe of the Table.

The firſt and ſecond Column ſhews the Moon's Age; the third the Southing.

Example.

The Moon being 9 days old, and her Southing required.

In the firſt Column under the Title *Moon's Age*, ſtands 9; over againſt it in the laſt Column in 7 hours, 12 minutes, the time of the Southing required.

Note alſo, the ſame Southing ſerves for 24 days old, as ſerves for 9 days, as the Table ſhews.

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppoſe the Moon being 9 Days old, the Time of Full Sea in the *Downs* is required.

By the foregoing Table it appears that a N.N.W. and S.S.E. Moon makes full Sea, which, as the ſaid Table ſhews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours.

But to be more exact, uſe the following Table and Directions.

Moon's Age.		Time. H	M
01	16	00	43
02	17	01	20
03	18	01	52
04	19	02	22
05	20	02	52
06	21	03	26
07	22	04	07
08	23	04	55
09	24	05	50
10	25	06	53
11	26	07	59
12	27	09	04
13	28	10	08
14	29	11	05
15	30	00	00

Having found the Time of Full Sea upon the Full and Change days, by the preceeding Table for that purpoſe, enter this Table with the Moon's Age; againſt which in the laſt Column are the Hours and Minutes to be added for the time of Full Sea deſired.

Example.

Suppoſe, as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* is required.

A N.N.W. and S.S.E. Moon making Full-Sea upon the Full and Change-days, which is 10 Hours 30 Min. which being found, enter this Table with the Moon's Age 9 Days, againſt which ſtands 5 Hours 50 Min. which added to 10 Hours 30 Min. makes 16 Hours 20 Minutes, or 4 Hours 20 Min. rejecting 12 Hours.

Here follows

A New and Exact KALENDAR

OF

The Sun's Place and Declination to every Day of the Year, for Firſt, Second, Third, and Leap-Years, newly Calculated, and made to ſerve (without ſenſible Error) till the Year 1732. *Likewiſe the Sun's Riſing, whereby may be found the Time of Setting, and Length of the Day and Night; together with the Southing of the Principal fixed Stars at Midnight.*

A

A Table of the Dominical Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feasts, *for* 23 *Years.*

Years.	Dom. Let.	Cycle ☉.	Prime	Epact.	Shrove-Sunday.		Easter-Sunday.		Whit-Sunday.	
1717	F	18	8	28	*March*	3	*April*	21	*June*	9
1718	E	19	9	9	*February*	23		13		1
1719	D	20	10	20		8	*March*	29	*May*	17
1720	C B	21	11	1		28	*April*	17	*June*	5
1721	A	22	12	12		19		9	*May*	28
1722	G	23	13	23		4	*March*	25		13
1723	F	24	14	4		24	*April*	14	*June*	2
1724	E D	25	15	5		16		5	*May*	24
1725	C	26	16	26	*February*	7	*March*	28		16
1726	B	27	17	7		20	*April*	10		29
1727	A	28	18	18		12		2		21
1728	G F	1	19	29	*March*	3		21	*June*	9
1729	E	2	1	11	*February*	16		6	*May*	25
1730	D	3	2	22	*February*	8	*March*	29		17
1731	C	4	3	3		28	*April*	18	*June*	6
1732	B A	5	4	14		20		9	*May*	28
1733	G	6	5	25		7	*March*	25		13
1734	F	7	6	6		24	*April*	14	*June*	2
1735	E	8	7	17		16		6	*May*	25
1736	D C	9	8	28	*March*	7		25	*June*	13
1737	B	10	9	9	*February*	20		10	*May*	29
1738	A	11	10	20		12		2		21
1739	G	12	11	1	*March*	04		22	*June*	10

Jun.

6
15

January hath XXXI Days.

Month days.	Week days.	Remarkable days, & ſouthing of ſtars at midnight.	First Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap Year 1724. 1728. 1732. 1736.			
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla		⊙ dec	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M	D.	M.
			♑		South.		♑		South.		♑		South.		♑		South.	
1	A	Circumciſ.	22	22	21	37	22	07	21	39	21	52	21	41	21	37	21	44
2	B	Sun r. 8. 0.	23	23	21	26	23	08	21	29	22	54	21	31	22	39	21	34
3	C		24	25	21	16	24	10	21	19	23	55	21	21	23	40	21	24
4	D		25	26	21	05	25	11	21	08	24	56	21	10	24	41	21	13
5	E		26	27	20	53	26	12	20	57	25	57	20	59	25	42	21	02
6	F	Epiphany.	27	28	20	41	27	13	20	45	26	58	20	48	26	43	20	51
7	G		28	29	20	30	28	14	20	33	28	00	20	36	27	45	20	39
8	A		29	30	20	17	29	16	20	20	29	01	20	23	28	46	20	27
9	B	*Sol.* in *Aqua.*	♒	32	20	04	♒	17	20	08	♒	02	19	58	29	47	20	14
10	C		01	33	19	51	01	18	19	54	01	03	19	48	♒	48	20	01
11	D		02	34	19	36	02	19	19	41	02	04	19	44	01	49	19	48
12	E	Sun r. 7. 44.	03	35	19	23	03	20	19	27	03	05	19	30	02	50	19	34
13	F		04	36	19	09	04	21	19	13	04	06	19	16	03	51	19	20
14	G		05	37	18	54	05	22	18	57	05	07	19	02	04	52	19	05
15	A		06	38	18	38	06	23	18	42	06	08	18	47	05	54	18	50
16	B		07	39	18	23	07	24	18	27	07	09	18	31	06	55	18	35
17	C		08	40	18	07	08	25	18	21	08	10	18	16	07	56	18	19
18	D		09	41	17	51	09	26	17	55	09	11	17	59	08	57	18	04
19	E		10	42	17	35	10	27	17	39	10	12	17	43	09	58	17	48
20	F		11	43	17	18	11	28	17	22	11	13	17	26	10	59	17	32
21	G		12	44	17	01	12	29	17	05	12	14	17	10	12	00	17	14
22	A	Sun r. 7. 30.	13	45	16	43	13	30	16	48	13	15	16	52	13	01	16	57
23	B		14	45	16	25	14	31	16	31	14	16	16	35	14	01	16	39
24	C		15	46	16	08	15	32	16	13	15	17	16	17	15	02	16	22
25	D	Co. St. *Paul.*	16	47	15	49	16	32	15	54	16	18	15	59	16	03	16	04
26	E		17	48	15	31	17	33	15	35	17	18	15	41	17	04	15	45
27	F		18	49	15	12	18	34	15	17	18	19	15	22	18	05	15	27
28	G		19	49	14	53	19	35	14	58	19	20	15	04	19	05	15	08
29	A		20	50	14	34	20	36	14	39	20	21	14	45	20	06	14	49
30	B	K. *Charles* B.	21	51	14	15	21	36	14	19	21	21	14	25	21	07	14	29
31	C		22	52	13	54	22	37	14	00	22	22	14	06	22	07	14	09

February hath XXVIII Days.

Month days.	Week days.	Remarkable days, & ſouthing of ſtars at midnight.	Firſt Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap Yea 1724. 1728. 1732. 1736.			
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♒		South.		♒		South.		♒		South.		♒		South	
1	D		23	52	13	34	23	38	13	40	23	23	13	45	23	08	13	50
2	E	Purif. *Mary*	24	53	13	14	24	38	13	20	24	24	13	25	24	09	13	30
3	F	Lion's Heart.	25	54	12	54	25	39	13	00	25	24	13	05	25	09	13	10
4	G		26	54	12	33	26	39	12	39	26	25	12	44	26	10	12	49
5	A		27	55	12	12	27	40	12	18	27	25	12	23	27	11	12	29
6	B	Lion's Neck.	28	55	11	51	28	40	11	57	28	26	12	02	28	11	12	08
7	C	Sun r. 7. 1.	29	56	11	30	29	41	11	36	29	26	11	42	29	12	11	47
8	D	*Sol* in *Piſces.*	♓	56	11	09	♓	41	11	15	♓	27	11	20	♓	12	11	25
9	E		01	56	10	48	01	42	10	54	01	27	10	59	01	13	11	04
10	F		02	57	10	25	02	42	10	34	02	28	10	37	02	13	10	43
11	G		03	57	10	04	03	43	10	10	03	28	10	16	03	13	10	21
12	A		04	58	09	42	04	43	09	48	04	28	09	54	04	14	09	59
13	B		05	58	09	20	05	43	09	26	05	29	09	32	05	14	09	37
14	C	*Valantine.*	06	58	08	58	06	43	09	04	06	29	09	10	06	14	09	15
15	D	Sun r. 6. 45.	07	58	08	35	07	44	08	42	07	29	08	47	07	15	08	53
16	E	Lower of two foremoſt	08	59	08	13	08	44	08	19	08	29	08	25	08	15	08	30
17	F	in □ of great	09	59	07	50	09	44	07	57	09	30	08	02	09	15	08	08
18	G	Bear.	10	59	07	27	10	44	07	34	10	30	07	40	10	15	07	45
19	A		11	59	07	05	11	44	07	11	11	30	07	17	11	15	07	22
20	B		12	59	06	42	12	44	06	48	12	30	06	54	12	15	06	59
21	C		13	59	06	19	13	44	06	25	13	30	06	31	13	15	06	36
22	D		14	59	05	56	14	44	06	01	14	30	06	12	14	15	06	13
23	E	Sun. r. 6. 29.	15	59	05	31	15	44	05	38	15	30	05	44	15	15	05	50
24	F	St. *Matthias.*	16	59	05	08	16	44	05	15	16	30	05	20	16	15	05	27
25	G		17	59	04	45	17	44	04	52	17	30	04	57	17	15	05	03
26	A		18	59	04	21	18	44	04	28	18	30	04	34	18	15	04	39
27	B		19	58	03	58	19	44	04	04	19	29	04	10	19	15	04	1
28	C		20	58	03	34	20	44	03	41	20	29	03	47	20	15	03	52
29	D		When it is Leap Year, *February* hath 29 days.												21	15	03	29

Month days.	Week days.	Remarkable days, and ſouthing of ſtars at midnight.	Firſt Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap Year. 1724. 1728. 1732. 1736.			
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♓		South.		♓		South.		♓		South.		♓		South.	
1	𝔇	David.	21	58	3	13	21	44	3	18	21	29	03	24	22	14	03	06
2	𝔈	Lyon's-Tail.	22	58	2	49	22	4	2	55	22	29	03	00	23	14	02	43
3	𝔉	Lower of two	23	57	2	25	23	43	2	31	23	28	02	37	24	14	02	28
4	𝔊	latter in ☐ of Great Bear.	24	57	2	1	24	43	2	7	24	28	02	13	25	13	01	54
5	𝔄		25	57	1	37	25	42	1	43	25	28	01	49	26	13	01	31
6	𝔅		26	56	1	13	26	42	1	19	26	27	01	25	27	12	01	07
7	ℭ		27	56	0	49	27	41	0	55	27	27	01	01	28	12	00	43
8	𝔇		28	55	0	26	28	41	0	32	28	26	00	38	29	11	00	20
9	𝔈		29	55	0	2	29	40	0	8	29	26	00	14	♈	11	N.	04
10	𝔉	Sun r. 6. 00.	♈	54	Nor.	21	♈	40	Nor.	15	♈	25	Nor.	10	01	10	00	28
11	𝔊		01	53	0	45	01	39	0	39	01	25	00	33	02	10	00	51
12	𝔄	Upper of two latter in ☐ of	02	53	1	9	02	39	1	3	02	24	00	57	03	09	01	15
13	𝔅	Great Bear.	03	52	1	32	03	38	1	26	03	23	01	21	04	08	01	39
14	ℭ		04	51	1	56	04	37	1	50	04	23	01	44	05	08	02	02
15	𝔇		05	51	2	19	05	36	2	13	05	22	02	08	06	07	02	26
16	𝔈		06	50	2	43	06	36	2	37	06	21	02	31	07	09	02	49
17	𝔉	Sun r. 5. 44.	07	49	3	6	07	35	03	10	07	20	02	55	08	05	03	13
18	𝔊		08	48	3	30	08	34	03	23	08	20	03	18	09	04	03	36
19	𝔄		09	47	3	53	09	33	03	47	09	19	03	41	10	04	03	59
20	𝔅		10	46	4	16	10	32	04	10	10	18	04	05	11	03	04	22
21	ℭ	Laſt but two	11	45	4	39	11	31	04	34	11	17	04	28	12	02	04	46
22	𝔇	in Great Bears	12	44	5	2	12	30	04	57	12	16	04	51	13	01	05	09
23	𝔈	Tail.	13	43	5	25	13	29	05	20	13	15	05	14	14	00	05	32
24	𝔉	S. r. 5. 30.	14	42	5	48	14	28	05	43	14	14	05	37	14	59	05	51
25	𝔊	Lady-day.	15	41	6	11	15	27	06	06	15	13	05	59	15	57	06	17
26	𝔄		16	40	6	34	16	26	06	28	16	12	06	22	16	56	06	40
27	𝔅		17	39	6	56	17	25	06	51	17	10	06	44	17	55	07	02
28	ℭ	*Virgins Spike*	18	38	7	19	18	23	07	13	18	09	07	07	18	54	07	25
29	𝔇	Laſt but one	19	36	7	41	19	22	07	36	19	08	07	29	19	52	07	47
30	𝔈	in Great	20	35	8	2	20	21	07	58	20	07	07	52	20	51	08	09
31	𝔉	Bears Tail.	21	34	8	25	21	20	08	19	21	05	08	05	21	50	08	31

April hath XXX Days.

Month days.	Week days.	Remarkable days, & ſouthing of ſtars at midnight	First 1721. 1729.		Year. 1725. 1733.		Second 1722. 1730.		Year. 1726. 1734.		Third 1723. 1731.		Year. 1727. 1735.		Leap 1724. 1732.		Year 1728 173	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M
			♈		North.		♈		North.		♈		North.		♈		North	
1	G	Sun r. 5. 16.	22	32	08	47	22	18	08	41	22	04	90	36	22	48	08	52
2	A		23	31	09	03	23	17	09	03	23	03	90	58	23	47	09	14
3	B		24	30	09	30	24	15	09	25	24	01	90	18	24	46	09	36
4	C	Laſt in Great Bears Tail.	25	28	09	51	25	14	09	46	25	00	90	41	25	44	09	57
5	D		26	27	10	13	26	12	10	07	25	58	10	03	26	43	10	18
6	E	Sun r. 5. 6.	27	25	10	94	27	11	10	29	26	57	10	24	27	41	10	40
7	F		28	23	10	55	28	09	10	50	27	55	10	45	28	39	11	01
8	G		29	22	11	16	29	08	11	11	28	54	11	06	29	38	11	19
9	A		♉	20	11	36	♉	06	11	31	29	52	11	26	♉	36	11	4
10	B		01	19	11	57	01	04	11	52	♉	5	11	47	01	35	12	02
11	C	Dragons Tail	02	17	12	17	02	03	12	12	01	49	12	07	02	33	12	22
12	D	Arcturus.	03	15	12	37	03	01	12	32	02	47	12	27	03	31	12	42
13	E		04	13	12	57	03	59	12	52	03	45	12	47	04	29	13	02
14	F		05	12	13	17	04	57	13	11	04	43	13	07	05	28	13	22
15	G		06	10	13	36	05	56	13	31	05	42	13	27	06	26	13	41
16	A	Sun r. 4. 48.	07	08	13	54	06	54	13	51	06	40	13	46	07	24	13	59
17	B		08	06	14	13	07	52	4	10	07	38	14	05	08	22	14	18
18	C		09	04	14	32	08	50	14	28	08	36	14	24	09	20	14	37
19	D		10	02	14	50	19	48	14	46	09	34	14	42	10	18	14	55
20	E	Southermoſt Scale of Lib.	11	00	15	09	10	46	15	04	10	32	15	00	11	16	15	14
21	F		11	58	15	27	11	44	15	22	11	39	15	18	12	14	15	31
22	G	Sun. r. 4. 37.	12	56	15	45	12	42	15	40	12	28	15	36	13	12	15	49
23	A	St. George.	13	54	16	02	13	40	15	58	13	26	15	54	14	10	16	07
24	B		14	52	16	19	14	38	16	15	14	24	16	11	15	08	16	24
25	C	St. Mark E.	15	50	16	36	15	36	16	14	15	22	16	28	16	06	16	41
26	D	Upper of two foremoſt in ◻ of Little Bear.	16	48	16	53	16	34	16	49	16	20	16	45	17	04	16	57
27	E		17	46	17	09	17	32	17	05	17	18	17	01	18	01	77	14
28	F		18	43	17	26	18	29	17	22	18	15	17	18	18	59	17	30
29	G		19	41	17	41	19	27	17	38	19	13	17	34	19	57	17	46
39	A	N. Scale ♎	20	39	17	57	20	25	17	53	20	11	17	47	20	55	18	01

May hath XXXI Days.

Month days.	Week Days.	Remarkable days, and southing of stars at midnight.	First 1721. 1729.		Year. 1725 1733.		Second 1722. 1730.		Year. 1726. 1734.		Third 1723. 1731.		Year. 1727. 1735		Leap 1724. 1732.		Year. 1728. 1736.	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♉		North.		♉		North.		♉		North.		♉		North	
1	B	Phil and Jac.	21	37	18	12	21	23	18	09	21	09	18	05	21	52	18	16
2	C	Sun. r. 4. 21.	22	34	18	27	22	20	18	24	22	06	18	20	22	50	18	31
3	D	Brightest in	23	32	18	42	23	18	18	38	23	04	18	35	23	48	18	45
4	E	the Crown.	24	30	18	56	24	16	18	53	24	02	18	49	24	45	19	00
5	F	Brightest in	25	27	19	10	25	13	19	07	24	59	19	04	25	43	19	14
6	G	Serpents neck	26	25	19	24	26	11	19	21	25	57	19	17	26	41	19	27
7	A		27	22	19	37	27	08	19	34	26	54	19	31	27	38	19	41
8	B		28	20	19	50	28	06	19	47	27	52	19	44	28	36	19	54
9	C	Scorpions	29	17	20	03	29	04	20	00	28	50	19	57	29	33	20	06
10	D	Forehead.	♊	15	20	15	♊	01	20	13	29	47	20	09	♊	31	20	19
11	E	Sun. r. 4. 8.	01	12	20	27	00	59	20	25	♊	45	20	21	01	28	20	31
12	F		02	10	20	38	01	56	20	36	01	42	20	33	02	26	20	42
13	G		03	07	20	50	02	53	20	47	02	40	20	45	03	23	20	53
14	A	Scorpions	04	05	21	01	03	51	20	58	03	37	20	56	04	21	21	03
15	B	Heart.	05	02	21	11	04	48	21	09	04	34	21	06	05	18	21	14
16	C		06	00	21	21	05	46	21	19	05	32	21	16	06	15	21	24
17	D		06	57	21	31	06	43	21	29	06	29	21	26	07	13	21	34
18	E		07	54	21	41	07	40	21	38	07	27	21	36	08	10	21	43
19	F		08	52	21	50	08	38	21	47	08	24	21	45	09	07	21	52
20	G	Sun. r. 3. 57.	09	49	21	59	09	35	21	56	09	21	21	54	10	05	22	02
21	A		10	46	22	07	10	32	22	05	10	19	22	03	11	02	22	09
22	B		11	44	22	15	11	30	22	13	11	16	22	11	11	59	22	17
23	C		12	41	22	22	12	27	22	21	12	13	22	19	12	57	22	25
24	D		13	38	22	29	13	24	22	28	13	10	22	26	13	54	22	32
25	E		14	35	22	36	14	22	22	34	14	08	22	33	14	51	22	38
26	F	Sun. r. 3. 53.	15	33	22	42	15	19	22	41	15	05	22	39	15	48	22	44
27	G		16	30	22	49	16	16	22	47	16	02	22	45	16	46	22	50
28	A		17	27	22	54	17	13	22	52	16	59	22	51	17	43	22	55
29	B	K.C. 2 B.&R.	18	24	22	59	18	10	22	58	17	57	22	56	18	40	22	59
30	C		19	21	23	04	19	08	23	03	18	54	23	01	19	37	23	05
31	D		20	19	23	10	20	05	23	07	19	51	23	06	20	34	23	09

Month Days.	Week Days.	Remarkable days, and ſouthing of ſtars at midnight.	First Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap Year. 1724. 1728. 1732. 1736.			
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D	M.	D.	M.	D.	M.	D.	M.	D.	M.
			Ⅱ		North.		Ⅱ		North.		Ⅱ		North.		Ⅱ		North	
1	E	Sun r. 3. 50.	21	16	23	12	21	02	23	11	20	48	23	10	21	31	23	13
2	F		22	13	23	16	21	59	23	14	21	45	23	14	22	29	23	17
3	G		23	10	23	19	22	56	23	17	22	42	23	17	23	26	23	20
4	A		24	07	23	21	23	53	23	20	23	40	23	20	24	23	23	22
5	B		25	04	23	23	24	51	23	23	24	37	23	22	25	20	23	24
6	C		26	01	23	25	25	48	23	25	25	34	23	24	26	17	23	26
7	D		26	59	23	27	26	45	23	27	26	31	23	25	27	14	23	27
8	E		27	56	23	28	27	42	23	28	27	28	23	27	28	11	23	28
9	F		28	53	23	29	28	39	23	29	28	25	23	28	29	09	23	29
10	G		29	50	23	29	29	36	23	29	29	22	23	29	♋	06	23	29
11	A	Sun r. 3. 47.	♋	47	23	29	♋	33	23	29	♋	19	23	29	01	03	23	29
12	B		01	44	23	29	01	30	23	29	01	16	23	29	02	00	23	28
13	C		02	41	23	28	02	27	23	28	02	13	23	28	02	57	23	27
14	D		03	38	23	27	03	24	23	27	03	11	23	27	03	54	23	26
15	E		04	35	23	25	04	21	23	25	04	08	23	25	04	51	23	24
16	F		05	32	23	23	05	19	23	23	05	05	23	23	05	48	23	22
17	G	Brighteſt in the Harp.	06	29	23	20	06	16	23	21	06	02	23	21	06	45	23	19
18	A		07	27	23	17	07	13	23	18	06	59	23	18	07	42	23	16
19	B		08	24	23	13	08	10	23	14	07	56	23	15	08	39	23	12
20	C		09	21	23	09	09	07	23	10	08	53	23	12	09	36	23	08
21	D	Sun r. 3. 50.	10	18	23	05	10	04	23	06	09	50	23	08	10	33	23	03
22	E		11	15	23	00	11	01	23	01	10	47	23	03	11	30	22	58
23	F		12	12	22	55	11	58	22	56	11	44	22	57	12	28	22	53
24	G	John Baptiſt.	13	09	22	50	12	55	22	51	12	41	22	52	13	25	22	48
25	A		14	06	22	45	13	52	22	45	13	38	22	47	14	22	22	42
26	B		15	03	22	39	14	49	22	39	14	36	22	41	15	19	22	36
27	C		16	00	22	32	15	46	22	33	15	33	22	34	16	16	22	29
28	D		16	57	22	25	16	44	22	26	16	30	22	27	17	13	22	21
29	E	Peter Ap.	17	55	22	17	17	41	22	19	17	27	22	20	18	10	22	15
30	F		18	52	22	09	18	38	22	11	18	24	22	13	19	07	22	07

July hath XXXI Days.

Month days.	Week Days.	Remarkable days, and ſouthing of ſtars at midnight.	First			Year.	Second			Year.	Third			Year.	Leap			Year.
			1721.			1725.	1722.			1726.	1723.			1727.	1724.			1728.
			1729.			1733.	1730.			1734.	1731.			1735.	1732.			1736.
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♋		North.		♋		North.		♋		North.		♋		North	
1	G	Sun. r. 3. 57.	19	49	22	01	19	35	22	03	19	21	22	04	20	04	21	58
2	A		20	46	21	52	20	32	21	54	20	18	21	56	21	01	21	50
3	B		21	43	21	43	21	29	21	45	21	15	21	48	21	59	21	41
4	C		22	40	21	34	22	26	21	36	22	13	21	39	22	56	21	21
5	D	Brighteſt be-	23	37	21	24	23	24	21	27	23	10	21	29	23	53	21	22
6	E	tween the	24	34	21	14	24	21	21	17	24	07	21	19	24	50	21	12
7	F	Eaglesſhould	25	32	20	04	25	18	21	07	25	04	21	09	25	47	21	01
8	G		26	29	20	53	26	15	20	56	26	01	21	00	26	45	20	50
9	A		27	26	20	42	27	12	20	45	26	58	20	49	27	42	20	49
10	B	Sun. r. 4. 8.	28	23	20	32	28	09	20	34	27	56	20	38	28	39	20	28
11	C		29	21	20	19	29	07	20	22	28	53	20	26	29	36	20	16
12	D		♌	18	20	07	♌	04	20	10	29	50	20	14	♌	33	20	05
13	E		01	15	19	55	01	01	19	59	♌	47	20	02	01	31	19	53
14	F		02	12	19	43	01	58	19	46	01	45	19	49	02	28	19	39
15	G		03	10	19	29	02	56	19	33	02	42	19	36	03	25	19	25
16	A	Sun. r. 4. 16.	04	07	19	16	03	53	19	20	03	39	19	23	04	22	19	13
17	B		05	04	19	03	04	50	19	06	04.	36	19	09	05	20	18	59
18	C	Swans Tail.	06	02	18	48	05	48	18	52	05	34	18	57	06	17	18	45
19	D	Dogdays beg	06	59	18	33	06	45	18	38	06	31	18	41	07	14	18	30
20	E		07	56	18	19	07	42	18	23	07	28	18	27	08	12	18	16
21	F	Sun. r. 4. 23.	08	54	18	04	08	40	18	08	08	26	18	12	09	09	18	01
22	G		09	51	17	49	09	37	17	53	09	23	17	57	10	07	17	45
23	A		10	48	17	33	10	34	17	38	10	21	17	42	11	04	17	30
24	B		11	46	17	17	11	32	17	22	11	18	17	21	12	01	17	14
25	C	James Ap.	12	43	17	02	12	29	17	06	12	15	17	10	13	59	16	58
26	D	Sun r. 4. 30.	13	41	16	46	13	27	16	50	13	13	16	52	14	56	16	41
27	E		14	38	16	29	14	24	16	33	14	10	16	37	15	54	16	24
28	F		15	36	16	12	15	22	16	16	15	08	16	20	16	51	16	07
29	G		16	33	15	55	16	19	15	59	16	05	16	03	17	49	15	50
30	A		17	31	15	38	17	17	15	42	17	03	15	44	18	47	15	33
31	B		18	28	15	02	18	14	15	24	18	20	15	28	19	44	15	[illegible]

Auguſt hath XXXI Days.

Month Days.	Week Days.	Remarkable days, and ſouthing of ſtars at midnight.	Firſt			Year.	Second			Year.	Third			Year.	Leap			Year.
			1721. 1729.			1725. 1733.	1722. 1730.			1726. 1734.	1723. 1731.			1727. 1735.	1724. 1732.			1728. 1736.
			☉ pla.		☉ dec.		☉ pla.		☉ dec		☉ pla		☉ dec.		☉ pla		☉ dec.	
			D.	M.	D.	M.	D.	M.	D	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♌		North.		♌		North.		♌		North.		♌		North	
1	C	Lammas.	19	26	15	02	19	12	15	06	18	58	15	11	19	42	14	57
2	D		20	24	14	44	20	10	14	48	19	56	14	53	20	39	14	39
3	E		21	21	14	25	21	07	14	30	20	53	14	34	21	37	14	20
4	F		22	19	14	07	22	05	14	11	21	51	14	16	22	35	14	00
5	G		23	17	13	48	23	02	13	52	22	49	13	57	23	33	13	42
6	A	Sun r. 4. 50.	24	14	13	29	34	00	13	33	23	46	13	38	24	30	13	23
7	B		25	12	13	09	24	58	13	14	24	44	13	19	25	28	13	04
8	C		26	10	12	50	25	56	12	54	25	42	12	59	26	26	12	44
9	D		27	08	12	30	26	54	12	35	26	40	12	40	27	23	12	24
10	E		28	05	12	10	27	51	12	15	27	37	12	20	28	21	12	04
11	F		29	03	11	50	28	49	11	55	28	35	12	00	29	19	11	44
12	G	*Sol* in *Virgo.*	♍	01	11	30	29	47	11	35	29	33	11	40	♍	17	11	24
13	A		00	59	11	09	♍	45	11	14	♍	31	11	19	01	15	11	04
14	B		01	57	10	48	01	43	10	54	01	29	10	59	02	13	10	43
15	C		02	55	10	28	02	41	10	33	02	23	10	38	03	11	10	22
16	D	Sun r. 5. 8.	03	53	10	17	03	49	10	12	03	25	10	17	04	09	10	01
17	E		04	51	09	43	04	37	09	51	04	23	09	56	05	07	09	40
18	F		05	49	09	24	05	35	09	29	05	21	09	35	06	05	09	18
19	G		06	47	90	03	06	33	09	08	06	19	09	13	07	03	08	57
20	A		07	45	08	41	07	31	08	46	07	17	08	52	08	01	08	35
21	B	Fomelhaut.	08	43	08	19	08	29	08	25	08	15	08	30	08	59	08	13
22	C	Sun r. 5. 19.	09	41	07	57	09	27	08	03	09	13	08	08	09	57	07	52
23	D		10	40	07	35	10	29	07	41	10	11	07	46	10	55	07	29
24	E	Barthoi. Ap.	11	38	07	13	11	24	07	19	11	10	07	24	11	54	07	07
25	F	Firſt in *Pega-*	12	36	06	51	12	22	06	56	12	08	07	02	12	52	06	45
26	G	*ſus* Wing.	13	34	06	18	33	20	06	34	13	06	06	40	13	50	06	23
27	A	Sun. r. 5. 29.	14	33	06	06	14	19	06	12	14	04	06	17	14	49	06	00
28	B	Dog days end	15	31	05	43	15	17	05	49	15	03	05	55	15	47	05	37
29	C	Dec. I. B.	65	29	05	21	16	15	05	26	16	01	05	32	16	45	05	15
30	D		74	28	04	58	17	14	05	04	17	00	05	09	17	44	04	52
31	E		84	26	04	35	18	12	04	41	17	58	04	46	18	42	04	20

September hath XXX Days.

Month days.	Week days.	Remarkable days, and southing of ſtars at midnight.	First 1721. 1729.	Year. 1725. 1733.			Second 1722. 1730.	Year. 1726. 1734.			Third 1723. 1731.	Year. 1727. 1735.			Leap 1724. 1732.	Year. 1728. 1736.		
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M	D.	M.	D.	M.	D.	M	D.	M	D.	M.	D.	M.
			♍		North.		♍		North.		♍		North.		♍		North	
1	F	Sun r. 5. 38.	19	25	04	12	19	11	04	16	18	56	04	23	19	41	04	06
2	G	Lon.burnt 66	20	23	03	49	20	09	03	54	19	55	04	00	20	39	03	43
3	A		21	22	03	26	21	08	03	33	20	54	03	37	21	38	03	20
4	B		22	21	03	03	22	06	03	08	21	52	03	14	22	37	02	57
5	C		23	19	02	40	23	05	02	45	22	51	02	51	23	35	02	33
6	D		24	18	02	17	24	04	02	22	23	49	02	28	24	34	02	10
7	E		25	17	01	53	25	02	01	59	24	48	02	04	25	33	01	47
8	F		26	15	01	30	26	01	01	35	25	47	01	41	26	31	01	23
9	G		27	14	01	06	27	00	01	12	26	46	01	18	27	30	01	00
10	A		28	13	00	43	27	59	00	48	27	44	00	54	28	29	00	36
11	B	*Andr. Head.*	29	12	00	19	28	57	00	25	28	43	00	31	29	28	00	13
12	C	Sun r. 6. 0.	♎	11	S	04	29	56	00	02	29	42	00	07	♎	27	S	10
13	D		01	09	00	27	♎	55	S	22	♎	41	S	16	01	25	00	14
14	E		02	08	00	51	01	54	00	45	01	40	00	39	02	25	00	57
15	F	End of Pega-	03	07	01	14	02	53	01	09	02	39	01	03	03	24	01	21
16	G	ſus Wing.	04	06	01	38	03	52	01	32	03	38	01	26	04	23	01	44
17	A		05	05	02	01	04	51	01	56	04	37	01	50	05	22	02	08
18	B		06	05	02	25	05	50	02	19	05	36	02	13	06	21	02	31
19	C		07	04	02	48	06	49	02	42	06	35	02	37	07	20	02	55
20	D	S. r. 6. 16.	08	03	03	12	07	49	03	06	07	34	03	00	08	19	03	18
21	E	Matthew Ev.	09	02	03	36	08	48	03	29	08	33	03	24	09	18	03	41
22	F		10	01	03	59	09	47	03	53	09	32	03	47	10	18	04	05
23	G	Pole Star.	11	01	04	22	10	46	04	16	10	32	04	10	11	17	04	28
24	A		12	00	04	45	11	46	04	39	11	31	04	-33	12	16	04	51
25	B	Southermoſt	12	59	05	08	12	45	05	02	12	31	04	57	13	15	05	14
26	C	in *Andromeda*'s Girdle.	13	59	05	31	13	44	05	25	13	30	05	20	14	15	05	37
27	D		14	58	05	54	14	44	05	48	14	29	05	43	15	14	06	00
28	E		15	58	06	17	15	43	06	11	15	29	06	06	16	14	06	23
29	F	Sun r. 6. 30.	16	57	06	40	16	4[illegible]	06	34	16	28	06	29	17	13	06	46
30	G		17	57	07	03	17	42	06	57	17	28	06	52	18	13	07	09

Month Days.	Week Days.	Remarkable days, and ſouthing of ſtars at midnight.	Firſt Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap Year. 1724 1728. 1732 1736.			
			⊙ pla.		⊙ dec.		⊙		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♎		South.		♎		South.		♎		South.		♎		South	
1	A	Sun r. 6. 38.	18	56	07	25	18	42	07	20	18	27	07	14	19	12	07	32
2	B		19	56	07	48	19	41	07	42	19	27	07	37	20	12	07	54
3	C		20	55	08	10	20	41	08	05	20	27	08	00	21	12	08	14
4	D		21	55	08	33	21	41	08	27	21	26	08	22	22	11	08	39
5	E		22	55	08	55	22	40	08	50	22	26	08	44	23	11	09	01
6	F		23	55	09	17	23	40	09	12	23	26	09	06	24	11	09	23
7	G		24	54	09	39	24	40	09	34	24	25	09	28	25	11	09	45
8	A		25	54	10	01	25	40	09	56	25	25	09	50	26	11	10	07
9	B		26	54	10	23	26	40	10	17	26	25	10	12	27	10	10	29
10	C		27	54	10	44	27	39	10	39	27	25	10	34	28	10	10	50
11	D	*Andromeda*'s	28	54	11	06	28	39	11	00	28	25	10	55	29	10	11	11
12	E	ſouthermoſt Foot.	29	54	11	27	29	39	11	22	29	25	11	17	♏	10	11	33
13	F		♏	54	11	48	♏	39	11	43	♏	25	11	38	01	10	11	54
14	G	Sun r. 7. 4.	01	54	12	09	01	39	12	03	01	25	11	59	02	10	12	14
15	A		02	54	12	29	02	39	12	24	02	25	12	19	03	10	12	35
16	B		03	54	12	50	03	39	12	45	03	25	12	40	04	10	12	55
17	C		04	54	13	10	04	40	13	05	04	25	13	00	05	10	13	16
18	D	*Luke* Evang.	05	54	13	30	05	40	13	25	05	25	13	20	06	11	13	36
19	E		06	54	13	50	06	40	13	45	06	25	13	40	07	11	13	55
20	F		07	55	14	10	07	40	14	05	07	25	14	00	08	11	14	15
21	G		08	55	14	29	08	40	14	24	08	26	14	2[illegible]	09	11	14	34
22	A		09	55	14	48	09	41	14	44	09	26	14	39	10	12	14	54
23	B		10	56	15	07	10	41	15	03	10	26	14	58	11	12	15	12
24	C		11	56	15	26	11	41	15	21	11	27	15	17	12	12	15	31
25	D	Sun r. 7. 24.	12	56	15	44	12	42	15	40	12	27	15	35	13	13	[illegible]	49
26	E		13	57	16	02	13	42	15	58	13	27	15	54	14	13	[illegible]	07
27	F		14	57	16	20	14	42	16	16	14	28	16	12	15	14	16	25
28	G	*Simon*&*Jude*	15	58	16	38	15	43	16	34	15	28	16	29	16	14	16	43
29	A		16	58	16	55	16	43	16	51	16	29	16	47	17	15	17	00
30	B		17	59	17	13	17	44	17	08	17	29	17	04	18	15	17	17
34	C	Sun r. 7. 33.	18	59	17	30	18	45	17	25	18	30	17	21	19	16	17	34

November hath XXX Days.

Month days.	Week days.	Remarkable days, and southing of stars at midnight.	First Year. 1721. 1725. 1729. 1733.				Second Year. 1722. 1726. 1730. 1734.				Third Year. 1723. 1727. 1731. 1735.				Leap-Year 1724. 1728 1732. 1736.			
			☉ pla.		☉ dec.		☉ pla		☉ dec		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M	D.	M.	D.	M.	D.	M	D.	M	D.	M.	D.	M
			♏		South.		♏		South.		♏		South.		♏		South.	
1	𝔇	All Saints.	20	00	17	47	19	45	17	42	19	30	17	38	20	16	17	51
2	𝔈	Sun r. 7. 36.	21	00	18	0	20	46	17	59	20	31	17	55	21	17	18	07
3	𝔉		22	01	18	18	21	46	18	15	21	32	18	11	22	18	18	22
4	𝔊	K. *W*. Nat.	23	02	18	34	22	47	18	30	22	32	18	27	23	19	18	37
5	𝔄	Pow. Plot.	24	02	18	49	23	48	18	46	23	33	18	42	24	19	18	52
6	𝔅		25	03	19	04	24	48	19	00	24	34	18	57	25	20	19	07
7	ℭ		26	04	19	18	25	49	19	15	25	35	19	12	26	20	19	22
8	𝔇		27	05	19	32	26	50	19	29	26	35	19	26	27	21	19	38
9	𝔈		28	05	19	46	27	51	19	43	27	36	19	40	28	22	19	50
10	𝔉		29	06	19	59	28	51	19	56	28	37	19	53	29	23	20	03
11	𝔊	*Martin B.*	♐	07	20	12	29	52	20	09	29	38	20	06	♐	24	20	16
12	𝔄		01	08	20	25	♐	53	20	22	♐	38	20	19	01	24	20	28
13	𝔅	Sun r. 7. 53.	02	09	20	37	01	54	20	34	01	39	20	31	02	25	20	40
14	ℭ		03	10	20	49	02	55	20	46	02	40	20	43	03	26	20	52
15	𝔇		04	11	21	01	03	56	20	58	03	41	20	55	04	27	21	03
16	𝔈	*Aldebaran.*	05	12	21	12	04	57	21	09	04	42	21	06	05	28	21	15
17	𝔉		06	13	21	22	05	58	21	20	05	43	21	17	06	29	21	25
18	𝔊		07	14	21	33	06	59	21	30	06	44	21	28	07	30	21	35
19	𝔄		08	15	21	43	08	00	21	40	07	45	21	38	08	31	21	45
20	𝔅		09	16	21	52	09	01	21	50	08	46	21	48	09	32	21	54
21	ℭ		10	17	22	01	10	02	21	59	09	47	21	57	10	33	22	03
22	𝔇		11	18	22	10	11	03	22	08	10	48	22	06	11	34	22	12
23	𝔈		12	19	22	18	12	04	22	16	11	49	22	14	12	35	22	20
24	𝔉	Sun r. 8. 5.	13	20	22	26	13	05	22	24	12	50	22	22	13	37	22	28
25	𝔊	*Capella*, or	14	21	22	34	14	06	22	32	13	51	22	30	14	38	22	35
26	𝔄	the Goat.	15	22	22	41	15	07	22	39	14	53	22	37	15	39	22	42
27	𝔅	*Orion*'s Left	16	23	22	47	16	08	22	46	15	54	22	44	16	40	22	48
28	ℭ	Foot.	17	25	22	53	17	10	22	52	16	55	22	50	17	41	22	54
29	𝔇	Bulls Horn.	18	26	22	58	18	11	22	57	17	56	22	56	18	42	23	00
30	𝔈	*Andrew* Ap.	19	27	23	03	19	12	23	02	18	57	23	01	19	43	23	05

December hath XXXI Days.

Month Days.	Week Days.	Remarkable days, and ſouthing of ſtars at midnight.	First 1721. 1729.		Year 1725. 1733.		Second 1722. 1730.		Year. 1726. 1734.		Third 1723. 1731.		Year. 1727. 1735.		Leap 1724. 1732.		Year 1728. 1736.	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec	
			D.	M.	D.	M.	D.	M.	D	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♐		South.		♐		South.		♐		South.		♐		South.	
1	F	First in *Ori-*	20	28	23	07	20	13	23	07	19	58	23	06	20	45	23	09
2	G	*on*'s Belt.	21	29	23	12	21	14	23	11	21	00	23	10	21	46	23	13
3	A	Laſt in *Orion*'s	22	31	23	16	22	16	23	15	22	01	23	14	22	47	23	17
4	B	Belt.	23	32	23	19	23	17	23	19	23	02	23	18	23	48	23	20
5	C	*Orion*'s right	24	33	23	22	24	18	23	2[illegible]	24	03	23	21	24	50	23	23
6	D	Shoulder, and	25	34	23	2[illegible]	25	19	23	24	25	04	23	23	25	51	23	25
7	E	*Auriga*'s	26	35	23	26	26	21	23	26	26	06	23	25	26	52	23	26
8	F	right ſhould.	27	37	23	28	27	22	23	28	27	07	23	27	27	53	23	28
9	G		28	38	23	29	28	23	23	28	28	08	23	28	28	55	23	29
10	A		29	39	23	29	29	24	23	29	29	1[illegible]	23	29	29	56	23	29
11	B	Shorteſt day.	♑	41	23	29	♑	26	23	29	♑	11	23	29	♑	57	23	29
12	C		01	42	23	29	01	27	23	29	01	12	23	29	01	58	23	29
13	D	Foot of the	02	43	23	28	02	28	23	28	02	13	23	28	03	00	23	28
14	E	great Dog.	03	44	23	26	03	30	23	27	03	15	23	27	04	01	23	26
15	F	Bright Foot	04	46	23	24	04	31	23	2[illegible]	04	16	23	25	05	02	23	24
16	G	of *Gemini*.	05	47	23	22	05	32	23	22	05	17	23	23	06	03	23	21
17	A	Sun r. 8. 12.	06	48	23	19	06	33	23	19	06	19	23	20	07	05	23	18
18	B	Mouth of	07	50	23	16	07	35	23	16	07	20	23	17	08	06	23	15
19	C	great Dog,	08	51	23	12	08	36	23	12	08	21	23	14	09	07	23	11
20	D	or *Syrius*.	09	52	23	07	09	37	23	09	09	22	23	10	10	09	23	06
21	E	*Thomas* Ap.	10	53	23	0[illegible]	10	39	23	04	10	24	23	05	11	10	23	00
22	F		11	55	22	57	11	40	22	59	11	25	23	00	12	11	22	55
23	G	Sun r. 8. 8.	12	56	22	51	12	41	22	53	12	26	22	54	13	13	22	49
24	A		13	57	22	45	13	42	22	47	13	28	22	48	14	14	22	43
25	B	Nat. *Chriſt*.	14	59	22	38	14	44	22	41	14	29	22	42	15	15	22	36
26	C	St. *Stephen*.	16	00	22	31	15	45	22	34	15	30	22	35	16	16	22	29
27	D	*John* Evan.	17	01	22	24	16	46	22	27	16	31	22	27	17	18	22	22
28	E	*Innocents*.	18	02	22	16	17	47	22	19	17	33	22	20	18	19	22	14
29	F	Caſtor.	19	04	22	08	18	49	22	11	18	34	22	12	19	20	22	05
30	G	Polux.	20	05	21	59	19	50	22	02	19	35	21	03	20	21	21	56
31	A	Sun r. 8. 1.	21	06	21	50	20	51	21	53	20	36	21	54	21	23	21	47

A Table of the Variation of the Sun's Declination, to every 15 Degrees of Longitude from the Meridian of *London*.

Diurn-Varia. min.	*Degrees of Longitude from the Meridian of* London. D. 15 m.	D. 30 m.	D. 45 m.	D. 60 m.	D. 75 m.	D. 90 m.	D. 105 m.	D. 120 m.	D. 135 m.	D. 150 m.	D. 165 m.	D12 180 m.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	06	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

Explanation of the Kalendar.

IN every Page there is eleven Columns; the firſt ſhews the Days of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, *&c.* the third the Southing of ſeveral Stars at Midnight, at which time the ſaid Stars are to be obſerved, thereby to find the Latitude; in the ſame Column is given the time of Sun-Riſing (and by ſubtracting the time of Riſing from 12 Hours, the time of Setting) the eight following Columns ſhew the Sun's Place and Declination for the Firſt, Second, Third, and Leap-year, according to their reſpective Titles.

For the more ready knowing of Leap-year, the following Table is inſerted, where it is found by Inſpection, as alſo the Firſt, Second, or Third Years after Leap-year.

Firſt Year.	Second Year.	Third Year.	Leap. Year.
1721	1722	1723	1724
1725	1726	1727	1728
1729	1730	1731	1732
1733	1734	1735	1736
1737	1738	1739	1740
1741	1742	1743	1744
1745	1746	1747	1748
1749	1750	1751	1752

The Uſe of the Kalendar.

To find the Day of the Week, or Month, for any Time paſt or to come by the Kalendar.

Firſt, find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppoſe it were required to find what Day of the Month will be the third Wedneſday in *March*, 1726.

Having found the Dominical Letter by the Directions in Page 21, which is B, turn to the Month of *March*, and account B for Sunday, three Days downward which is E for Wedneſday, and the third Wedneſday is the 23d of *March* as was required.

Example 2. What day of the Week will the ſecond of *September* be in the Year 1720?

This Year being Leap-year has two Dominical Letters C and B, the firſt ſerving from the firſt of *January* to the end of *February*, the latter from thence to the Years end.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents Friday the Day of the Week required.

Note, That the *Gregorian* or *Foreign* Account, begins 11 Days before ours, ſo that our firſt of *January* is their 12th, our 12th their 23d, our 23d, their 3d of *February*, our 24th of *February* is their 7th of *March*; but in Leap-year, our 24th of *February* is their 6th of *March*, becauſe then *February* hath 29 Days.

To find the Sun's Place and Declination by the Kalendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January* 1723, being the third after Leap Year.

In the Month of *January*, in the firſt Column look the Day of the Month, over-againſt which, under the third Year ſtands 1. 3, that is, the Sun's Place is in 1 deg. 3 min. of *Aquaries*; in the next Column under the ſaid Year ſtands 19, 58, under the Title South, which ſhews the Declination to be 19 deg. 58 min. Southerly; and this ſerves for the Year 1723, on the ſaid 10th of *January*, being the third after Leap-Year.

Example 2. Suppoſe the Sun's Place and Declination to be required on the 10th of *March* 1724, being Leap-Year.

In the Month of *March*, in the firſt Column find the Day of the Month, over-againſt which, under Leap-Year ſtands 1.10, which ſhews the Sun's Place to be in 1 deg. 10 min. of *Aries*; and in the next Column under Leap Year ſtands 00. 28, which ſhews the Declination to be 28 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalendar, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Kalendar it is calculated to the Meridian of *London*, for which end the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London* immediately following the Kalendar is added; the Uſe and Explanation whereof follows.

IN the firſt Column is the Diurnal Variation, which is found by ſubtracting the Declination of the given Day of the Month, from the Declination for the day following; or contrarily this from that, that is the leſſer from the greater, and the difference is the diurnal Variation. In the head of the other Columns are degrees of Longitude from *London*, either Eaſterly or Weſterly; and in thoſe Columns under the reſpective degrees of Longitude, are the Minutes of Declination, anſwerable to the diurnal Variation. As ſuppoſe the diurnal Variation were 10 min. and the difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the Head of the Table, ſtands 2 minutes, which anſwers thereto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declination.

The Rule. Firſt, if the difference of Longitude be Weſterly, and the Declination encreaſing, the Variation found in this Table muſt be added to the Declination found in the Kalender; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, if the difference of Longitude be Eaſterly, and the Declination encreaſing, the Variation aforeſaid muſt be ſubtracted: but the Declination decreaſing muſt be added.

Example 1. *April* the 19th 1724, being at Sea, the difference of Longitude from the Meridian of *London*, being 90 degrees Weſterly, I find the

Declination in the Kalendar to be 14 deg. 55 min. North; and the 20th Day. the Declination is 15 deg. 14 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 19 min. which is the daily increaſe. Then in the Table under 90 deg. and over-againſt 19 ſtands 5 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 14 deg. 55 min. before found, which makes the true Declination 15 deg. 00 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 5 min. found in the Table muſt have been ſubtracted.

It is eaſily diſcerned whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer; for if it be greater, then it increaſes; but if leſs then it decreaſes.

Example 2. *January* the 10th 1721, being at Sea, the Difference of Longitude from *London* being 120 deg. Weſterly, I find the Declination in the Kalender to be 19 deg. 51 min. South, and the 11 Day it is 19 deg. 36 min. therefore ſubtracting the leſſer from the greater, the Difference is 15 min. which is the daily decreaſe; Then in this Table under 120 deg. and againſt 15 ſtands 5 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 19 deg. 46 min. South. If the Difference of Longitude had been Eaſterly, the 5 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Declination of the *Sun* is moſtly uſed at Sea, with the Complement of the *Sun's* Meridian Altitude (commonly called the *Zenith Diſtance*) taken by the Quadrant or Croſs-ſtaff, to find the Latitude of the Place; For which take the following Directions.

1. If the *Sun* come to the Meridian in the *South*, and the Declination be *North*, then the Declination added to the Complement of the Altitude is the Latitude *Northerly*.

Examp. Suppoſe being at *Sea*, the 10th of *April* 1721, the Declination is found by the Table 11 deg. 57 min. North, the *Sun* comes to the Meridian in the *South*; the Complement of the Altitude got by Obſervation is 23 deg. 10 min. What is the Latitude?

	°	′
Complement of the Altitude is	23	10
Declination North added	11	57
The Latitude North	35	07

2. If the *Sun* comes to the Meridian in the *North*, and hath *North* Declination, then ſubtract the Complement of the Altitude from the Declination, the Remainder is the Latitude *North*. But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude *Southerly*.

Example 1. Suppoſe being at Sea *May* 10th, 1721, the Declination being 20 deg. 15 min. *North*, the *Sun* comes to the Meridian in the *North*, the Complement of the Altitude by Obſervation is 17 deg. 23 min. What is the Latitude?

Declination North is	20°	15′	
Compliment Altitude ſubtracted	17	23	
The Latitude is	02	52	

Example 2. Suppoſe being at Sea, *June* 10*th* 1721, the Declination by the Table is 23 deg. 29min. North, the Complement of the Altitude, by Obſervation is 33 deg. 10 min. the Sun comes to the Meridian in the North: What is the Latitude?

	°	′	
Complement Altitude is	33	10	
Declination North ſubtracted	23	39	
Latitude is	09	41	South.

3. If the *Sun* comes to the Meridian in the North, and have *South Declination*, the *Declination* added to the Complement of the Altitude, is the Latitude South.

Example. Suppoſe being at Sea, *January* the 10*th* 1724: the *Sun* comes to the Meridian in the North, the Complement of the Altitude is 22 deg. 10 min. the *Declination* 20 deg. 01m. South: What is the Latitude?

Complement of the Altitude is	22°	10′	
Declination South added	20	01	
The Latitude is	42	11	South.

4. If the *Sun* comes to the Meridian in the *South*, and have *South Declination*, ſubtract the Complement of the Altitude, from the *Declination*, the Remainder is the Latitude South. But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude North.

Examp. 1. Suppoſe being at Sea, *January* 1*ſt*, 1724, the *Sun* coming to the Meridian in the *South*. The Complement of the Altitude is 10 deg. 36 min. the *Declination* 21 deg. 44m. South: What is the Latitude?

	°	′
Declination South	21	44
Complement Altitude ſubtracted	10	36
Latitude South	11	08

Example 2. Suppoſe being at Sea, *February* the 10*th*, 1723, the *Sun* coming to the Meridian in the *South*, the Complement of the Altitude is 25 deg. 20 min. the Declination 10 deg. 37 min. *South*: What is the Latitude?

	°	′
Complement Altitude is	25	20
Declination South ſubtracted	10	37
Latitude North	14	43

5. If the *Sun* be in the Zenith, (that is right over head) if it have either North or South Declination, the Declination is the Latitude Northerly, or Southerly.

6. If the *Sun* have no Declination, the Complement of the Altitude is the Latitude, which is Northerly or Southerly, according as the *Sun* is to the Northward or Southward of the Equinoctial.

A Table of the Sun's Right Aſcenſion.

Days.	*Jan.* ☉ Right Aſcen.		*Feb.* ☉ Right Aſcen.		*March.* ☉ Right Aſcen.		*April.* ☉ Right Aſcen.		*May.* ☉ Right Aſcen.		*June.* ☉ Right Aſcen.	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	19	36	21	43	23	29	01	22	03	15	05	20
2	19	40	21	47	23	33	01	26	03	19	05	24
3	19	44	21	51	23	37	01	30	03	23	05	28
4	19	49	21	55	23	40	01	34	03	27	05	32
5	19	53	21	59	23	44	01	37	03	31	05	37
6	19	57	22	03	23	47	01	41	03	35	05	41
7	20	01	22	07	23	51	01	45	03	39	05	45
8	20	05	22	11	23	54	01	48	03	43	05	49
9	20	09	22	15	23	58	01	52	03	47	05	53
10	20	14	22	18	00	02	01	55	03	51	05	57
11	20	18	22	22	00	06	01	59	03	55	06	01
12	20	23	22	26	00	09	02	03	03	59	06	05
13	20	27	22	30	00	13	02	07	04	03	06	09
14	20	31	22	34	00	16	02	11	04	07	06	13
15	20	35	22	37	00	20	02	14	04	11	06	18
16	20	39	22	41	00	24	02	18	04	15	06	22
17	20	43	22	45	00	27	02	22	04	19	06	27
18	20	47	22	49	00	31	02	26	04	23	06	30
19	20	51	22	53	00	34	02	30	04	27	06	34
20	20	55	22	56	00	38	02	33	04	31	06	39
21	20	59	23	00	00	42	02	37	04	35	06	43
22	21	04	23	04	00	45	02	41	04	39	06	47
23	21	08	23	07	00	49	02	45	04	43	06	51
24	21	12	23	11	00	53	02	49	04	47	06	55
25	21	16	23	14	00	56	02	52	04	51	06	59
26	21	20	23	18	01	00	02	56	04	55	07	03
27	21	24	23	22	01	04	03	00	04	59	07	07
28	21	28	23	26	01	07	03	04	05	03	07	11
29	21	32			01	11	03	08	05	07	07	15
30	21	36			01	15	03	11	05	12	07	20
31	21	39			01	18			05	16		

A Table of the Sun's Right Aſcenſion.

Days.	July. ☉ Right Aſcen.		Auguſt. ☉ Right Aſcen.		Septem. ☉ Right Aſcen.		October. ☉ Right Aſcen.		Novem. ☉ Right Aſcen.		Decem. ☉ Right Aſcen.	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	07	24	09	26	11	20	13	09	15	08	17	16
2	07	28	09	30	11	24	13	13	15	12	17	21
3	07	32	09	34	11	27	13	16	15	16	17	26
4	07	36	09	38	11	31	13	20	15	20	17	30
5	07	40	09	41	11	34	13	23	15	24	17	35
6	07	44	09	45	11	37	13	27	15	28	17	39
7	07	48	09	49	11	42	13	31	15	32	17	43
8	07	52	09	52	11	45	13	35	15	37	17	40
9	07	56	09	56	11	49	13	39	15	41	17	52
10	08	00	09	59	11	52	13	42	15	46	17	57
11	08	04	10	03	11	56	13	46	15	50	8	01
12	08	08	10	07	12	00	13	50	15	54	8	06
13	08	12	10	11	12	03	13	54	15	59	18	10
14	08	16	10	15	12	07	13	58	16	03	18	15
15	08	20	10	18	12	10	14	01	16	08	18	20
16	08	24	10	22	12	14	14	05	16	12	18	24
17	08	28	10	26	12	18	14	09	16	16	18	29
18	08	32	10	29	12	21	14	13	16	20	18	34
19	08	36	10	33	12	25	14	17	16	24	18	38
20	08	40	10	36	12	28	14	21	19	29	18	42
21	08	44	10	40	12	32	14	25	16	33	18	46
22	08	48	10	44	12	36	14	29	16	37	18	50
23	08	52	10	48	12	39	14	33	16	41	18	55
24	08	56	10	51	12	43	14	37	16	45	18	59
25	08	59	10	54	12	46	14	40	16	50	19	04
26	09	03	10	58	12	50	14	44	16	54	19	08
27	09	07	11	02	12	54	14	48	16	58	19	12
28	09	11	11	05	12	58	14	52	17	03	19	17
29	09	15	11	09	13	02	14	56	17	07	19	21
30	09	18	11	12	13	06	15	00	17	12	19	26
31	09	22	11	16			15	04			19	31

A

A Table ſhewing the Right Aſcenſion, Declination and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magni.	Right Aſcenſ.		Decli-nation.		
		H.	M.	D.	M.	
Pole Star	2	00	32	87	33	N
Girdle of Andromeda	2	00	50	33	50	N
Acarner, or laſt in Eridanus	1	01	25	58	55	S
Bright Star of Aries	2	01	51	22	04	N
Maduſa's Head	2	02	49	39	48	N
Bright ſide of Perſeus	2	03	04	04	48	N
Brighteſt of the Seven Stars	3	03	29	22	55	N
Aldebaran or Bull's *Eye*	1	04	18	15	50	N
Capella, or the Goat	1	04	55	45	38	N
Bright Foot of Orion	1	05	01	08	37	S
Middle Star in Orion's Belt	3	05	20	01	26	S
Orion's Right Shoulder	1	05	39	07	18	N
Auriga's Right Shoulder	2	05	44	44	56	N
Bright Foot of Gemini	2	06	19	16	38	N
Syrius, or the Great Dog	1	06	32	16	20	S
Caſtor, or Apollo	2	07	16	32	29	N
Procyon the Little Dog	2	07	24	05	57	N
Pollux, or Hercules	2	07	25	28	46	N
South Arm of the Crab	3	08	40	13	48	N
Hydra's Heart	1	09	12	07	10	S
Lyon's Heart, or Baſlisk	1	09	51	13	36	N
The Lower of the Pointers	2	10	41	58	08	N
The Upper of the Pointers	2	10	43	63	32	N
Lyon's Tail	1	11	31	16	12	N
Upper of 2 laſt in Ⅱ *of Great* Bear	2	12	00	58	51	N
Laſt but 2 in the Great Bear's *Tail*	2	12	40	57	47	N
Virgins Spike	1	13	10	09	31	S
Laſt but one in the Great Bear's *Tail*	2	13	10	56	41	N
Laſt in the Great Bear's *Tail*	2	13	34	51	00	N
Dragon's Tail	2	13	59	65	56	N
Arcturus	1	14	02	20	54	N
South Ballance	2	14	32	14	33	S
Foremoſt Guard	2	14	51	75	36	M
Brighteſt of the Crown	2	15	21	27	43	N
Brighteſt of the Serpent's Neck	2	15	33	07	30	N

Antares, the Scorpions Heart	1	16	12	25	46	S
Head of Hercules	3	17	02	14	45	N
Ophincus, or Serpent's Head	3	17	22	12	48	N
Lyrœ, or the Heart	1	18	27	38	33	N
Swan's Bill	3	19	17	27	18	N
Vulture, or Eagles Heart	2	19	34	08	00	N
Hand of Atonias	3	19	56	01	39	S
Swan's Tail	2	20	30	44	05	N
Mouth of Pegaſus	3	21	27	08	19	N
Fomelhaut	1	22	41	31	51	S
Marchab, or Pagaſus Wing	2	22	48	13	28	N
Scheat, or Pegaſus Leg	2	22	50	26	50	N
Cephus's Knee	3	23	20	76	05	N
Andromada's Head	2	23	53	27	28	N
End of Pagaſus Wing.	2	23	57	13	20	N

The Explanation and Uſe of the TABLE *of the Sun's Right Aſcenſion; and of the Table of the Star's Right Aſcenſion and Declination.*

IN the Table of the *Sun's* Right Aſcenſion, the firſt Page contains the firſt ſix Months of the Year; the next Page the other ſix Months. At the Head of the Table are the Months; in the firſt Column towards the Left Hand are the Days of the Month, and in the oppoſite Column is the Right Aſcenſion in Hours and Minutes.

In the Table of the *Fix'd-Stars*, there are four Columns; in the firſt towards the Left Hand, are the Names of the *Stars*; in the ſecond, the *Star's* Magnitude; in the third, the Right Aſcenſion in Hours and Minutes in the 4th, their Declination in degrees and Minutes; N. or S.

Firſt, to find the Time of the *Star's* coming upon the Meridian.

The Rule. Look the Right Aſcenſion of the *Sun* and *Star*, and ſubtract the Right Aſcenſion of the *Sun* from the Right Aſcenſion of the *Star*, but if the *Star's* Right Aſcenſion be leſs than the *Sun's*, add thereto 24 hours, and then ſubtract; the Remainder after ſubtraction, is the time of the *Star's* coming upon the Meridian from Noon: But if the Remainder exceed 12 Hours ſubtract 12 Hours therefrom, and then the Remainder is the time from Midnight.

Example 1. Suppoſe the time that *Fomelhaut* comes upon the Meridian on the 10th of *October* required.

I find in the Table of the *Star's* Right Aſcenſion to be 22 hours 41 min. and the *Sun's* to be 13 hours 42 min. which ſubtracted from the *Star's* Right Aſcenſion, leaves 8 hours 59 min. the time of the *Star's* coming upon the Meridian, Afternoon.

Example 2. Suppoſe the time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* were required.

I find the *Star's* Right Aſcenſion to be 4 hours 18 M. the *Sun's* 14 hours 1 min. Now becauſe the *Sun's* Right Aſcenſion is more than the *Star's*, add to the *Star's* Right Aſcenſion 24 hours, which makes 28 hours 18 min from which ſubtracting the *Sun's* Right Aſcenſion 14 hours 1 min. there remains 14 hours 17 min. from which ſubtracting 12 hours, there remains 2 hours 17 min. which is the Time of this *Star's* Southing after Midnight, which was required.

Secondly. The Time being given, to find what *Star* will come to the Meridian about the ſame time.

The Rule. To the *Sun's* Right Aſcenſion add the time from Noon, at which the *Star's* coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the *Star* that will come to the Meridian at that time; with which enter the Table of the *Star's* Right Aſcenſion and Declination, where look what *Star's* Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the *Star* ſought for.

Examp. Suppoſe *March* 27*th*, I deſire to know what *Star* will come upon the Meridian about 8 at Night.

The *Sun's* Right Aſcenſion is 1 hour 4 minutes: the time from Noon is 8 hours, which added to the *Sun's* Right Aſcenſion, makes 9 hours 4 minutes: the neareſt is the Table in *Hydra's Heart*, whoſe Right Aſcenſion is 9 hours 12 minutes, and therefore *Souths* at 8 hours 8 minutes, and ſo in others.

Directions for Obſervations of the Stars, to find the Latit. of the Place.

Having before ſhewn how to find the Time of a *Star's* coming to the Meridian, I ſhall now ſhew how by the *Star's* Altitude to find the Latitude.

Note, In North Latitude, thoſe *Stars* whoſe North Declination exceeds the Complement of the Latitude, may be obſerved under the Pole. And the ſame may be performed by the Southern *Stars* in South Latitude.

Directions for finding the Latitude, by the Meridional Altitude of the Fixed Stars.

Rule 1. If the *Star* comes to the Meridian in the *South*, and hath *North* Declination: the Complement of the Altitude (got by Obſervation) added to the Declination of the *Star*, found in the Table of the *Star's* Right Aſcenſion and Declination gives the Latitude *North*.

Example. On the 10*th* of *January* being at Sea, I find by the foregoing Directions, that the *Lyons Heart* comes to the Meridian in the South at 1 hour 37 minutes after Midnight, the Meridional Altitude thereof by Obſervation is 63 Degrees, which ſubtracted from 90 degrees, there remains 27 degrees the Complement of the Altitude; to which adding 13 degrees 36 minutes the Declination of the *Star* North, gives 40 degrees 36 minutes the Latitude of the Place North, which was required.

Rule 2. If a *Star* comes to the Meridian in the *South*, and have *South* Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude *North*. But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude *South.*

Example 1. Suppoſe on the 10th of *July*, being at Sea, the Star *Fomelhaut* coming to the Meridian in *South*, at 2 hours 41 min. after Midnight, the *Merid. Alt.* is 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the *Star's Declination* is 31 deg. 51 min. *South*; which ſubtracted from the Compl. of *Alt.* leaves 22 deg. 19 min. which is the Latitude *North.*

Example 2. Suppoſe on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the *Meridian* in the *South* at 9 hours 33 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the *Declination* 25 degrees 46 minutes *South*; from which ſubtracting the Complement of the *Altitude* there remains 20 deg. 19 min. which is the Latitude *South.*

Rule 3. If a *Star* comes to the Meridian in the *North* above the *Pole*, and have North *Declination*, ſubtract the *Declination* from the Complement of the Altitude, the Remainder is the Latitude *South.* But if the *Declination* exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude *North.*

Example 1. On the 11th of *June*, the *brighteſt in* the *Harp* comes to the Meridian in the *North* at 26 minutes after Midnight, the Complement of the Altitude is 79 degrees, from which ſubtracting the *Declination*, which is 38 deg. 33 min. *North*, there remains 40 deg. 27 min. which is the Latitude *South.*

Example 2. On the 8th of *September*, *Andromada's-Head* comes to the Meridian in the *North* at 8 minutes after Midnight; the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the *Declination* 27 deg. 28 min. gives 20 deg. 18. min. which is the Latitude *North*.

Rule 4. If a *Star* comes to the Meridian in the *North*, and have *South Declination*, the Complement of the Altitude added to the *Declination* gives the Latitude *South.*

Example. On the 12th of *December*, *Syrius (or the Great Dog's Mouth)* comes to the Meridian in the *North* at 26 minutes after Midnight, the Complement of the Altitude is 30 degrees, to which adding 16 deg. 20 min. the *Declination South*, gives 46 deg. 20 min. the Latitude *South.*

Rule 5. If a *Star* comes to the Meridian under the *Pole*, then add the Complement of the *Declination* to the Meridian Altitude, and the Sum is the Latitude either *North* or *South*, according to the *Star's Declination.*

Example. On the 10th of *March*, the *Pole Star* comes to the Meridian under the *Pole*, at 30 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the *Declination* 2 deg. 27 min. which added together gives 46 deg. 57 min. which is the Latitude *North.*

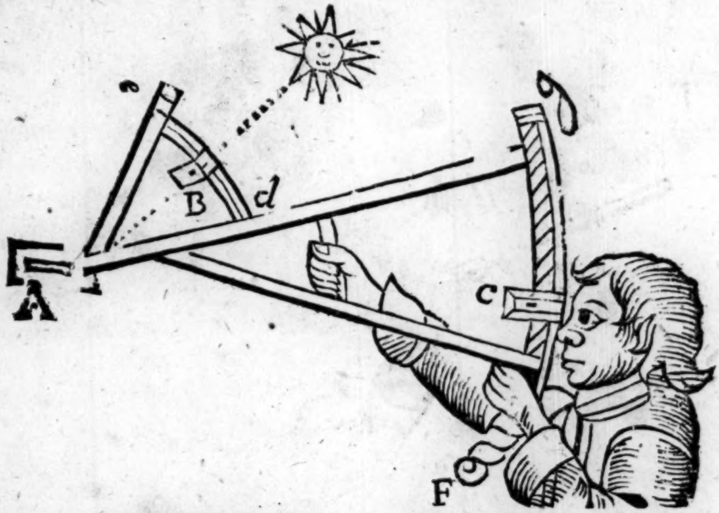
Rule 6. If the *Star* be in Zenith, the *Declination* is the Latitude either *North* or *South*, according to the *Declination* of the *Star*.

Rule 7. If the *Star* have no *Declination*, the Complement of the *Meridian* Altitude is the Latitude of the Place either *North* or *South*, according as the *Star* is either to the Northward or Southward.

The

The Deſcription and Uſe of the Sea-Quadrant.

THIS Inſtrument conſiſts of Three Vanes and Two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon, as at A. The Shadow-Vane, ſo called becauſe of it's giving the Shadow upon the Horizon Vane in time of Obſervation, as at B. Laſtly, the Sight Vane, which in time of Obſervation is placed at the Eye, through which the Shadow and Horizon are ſeen, as at C. The leſſer of the Arches, marked with *d e*, is called the *Sixty Arch*, becauſe it contains ſixty (or more commonly of late 65) degrees. In time of Obſervation, the Shadow Vane is placed upon this Arch always to an even degree; it is numbred from the upper end at *e*, and downward to *d*, with 5, 10, 15. 20, *&c* The bigger Arch marked with g *F*, is called the *Thirty Arch*, becauſe it contains 30 (or rather 25) degrees, it is divided into degrees and minutes.

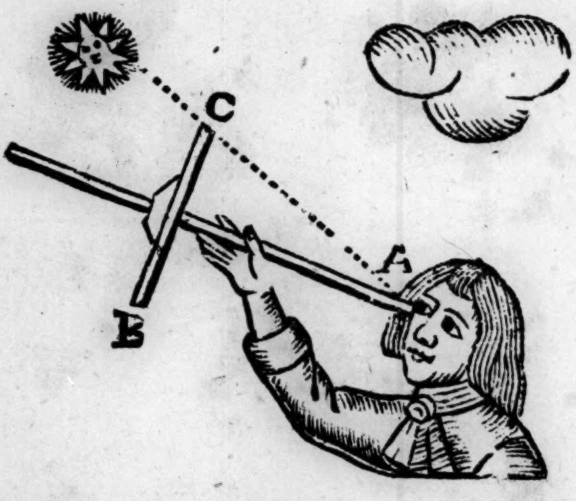


The Uſe of this Inſtrument is to take the *Sun's* Meridian Altitude; which is done in the manner following.

Put the Horizon Vane at the End of the Quadrant at A, the ſhadow-Vane upon the ſixty (or leſſer Arch) to a Number of degrees leſs than the Complemant of the Altitue by 16 or 20 deg. and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, the back being turned towards the *Sun*, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the Shadow of the upper edge of the ſhadow Vane to fall upon the upper part of the ſlit in the Horizon Vane, where uſually (for Perſpicuity ſake) there is drawn a black Line; and if at the ſame time the Horizon appear thro' the ſaid ſlit in the Horizon Vane, that is the *Sun*'s preſent Altitude; but if the Sea appears inſtead of the Horizon, then ſlide the Sight Vane lower towards the F; if the Sky appear inſtead of the Horizon, then ſlide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian

Altitude, which is the greateſt Altitude the *Sun* will have that Day, and is the thing uſed to find the Latitude, continuing obſerving, and as the *Sun* riſes the Sea will appear through the Horizon-Vane; then muſt the Sight Vane be removed lower: And thus continue obſerving, as often as may be convenient, till the *Sun* be at the higheſt, which is the Meridian Altitude. When the *Sun* begins to fall, the Sky will appear inſtead of the Horizon, and then it's time to give over obſerving for that Day. Having thus done, add the degrees upon the Sixty-Arch to the Degrees and Minutes upon the Thirty-Arch, and the Sum is the Complement of the Meridian Altitude; the uſe of which for finding the Latitude, is ſufficiently ſhewed in the preceeding Rules.

The Deſcription and Uſe of the Croſs-ſtaff *or* Fore-ſtaff.



THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and it belongs to that ſide of the Staff which is numbred from about 3 degrees to 10 degrees. Sometimes the Thirty Croſs, and the reſt of the Croſſes are ſo made, as that the Breadth thereof ſerves inſtead of this Ten Croſs.

The ſecond Croſs is called the Thirty Croſs, and belongs to that ſide of the ſtaff which is numbred from about 10 degrees to 30.

The third Croſs is called the Sixty Croſs, and belongs to that ſide of the Staff which is numbred from about 20 to 60 degrees.

The fourth and laſt Croſs is called the Ninety Croſs, and belongs to that ſide of the Staff which is numbred from about 30 to 90 degrees.

This Staff is likewiſe numbred with the Complement to 90 degrees, (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60, and ſo the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the *Sun* or *Stars*, which is done as followeth.

Firſt, Conſider what the *Sun's* greateſt Altitude will be that Day, and accordingly uſe the Croſs moſt ſuitable, (*viz.*) If the Meridian Altitude be judged to be under 10 Degrees, uſe the Ten-Croſs; if between 10 and 30, the Thirty-Croſs; if between 30 and 60, the 60 Croſs; if between 60 and 90, the Ninety-Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat end of the Staff at A, to the out-ſide of the Eye, as near as may be, without hindering the ſight: Thus the Face being toward the Sun or Star, hold the Croſs upright; then look at the upper end of the Croſs at C for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appear inſtead of the Horizon, remove the Croſs a little farther from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the ſide of the Staff belonging to the Croſs uſed in Obſervation will be found the degrees and Minutes of the the Altitude of the Sun or Star But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſide of the Staff, proper to the Croſs uſed, are found the degrees and minutes of the Sun's Meridian Altitude, which ſubtracted from 90 degrees, gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions aforegoing.

The Deſcription and Uſe of the Nocturnal.

IT conſiſts of three Parts. The firſt and unmoveable Part, on which is the Handle, by which to hold it in Time of Obſervation; upon the Fore-ſide of which, in the outermoſt Circle are the Days of the Month, and upon the innermoſt are ſet off the 24 hours, and upon the Back-ſide are the 32 Points of the Compaſs.

There are two ſorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Thoſe that are made for the *Great Bear*, have *February* at the Top, but thoſe that are made for the *Little Bear*, have *April*, but now they are commonly made for both Bears, having two Indexes.

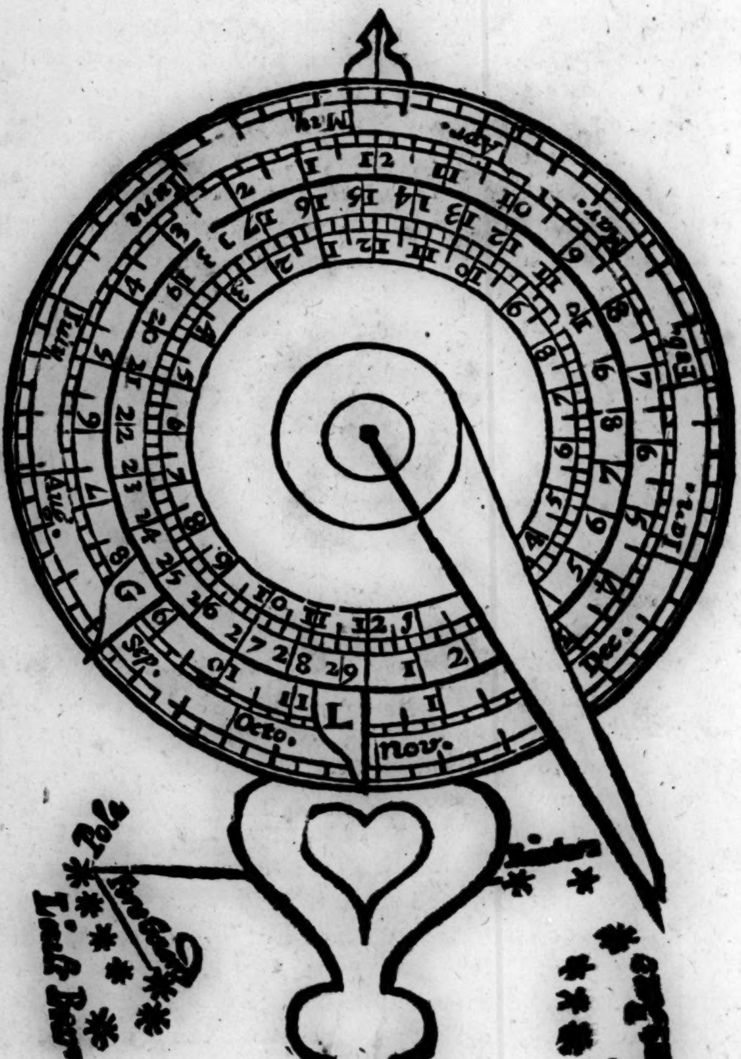
The ſecond, or middle Part, contains two Circles, and the aforeſaid Indexes, one marked *G*, for the Great Bear, and the other marked *L*, for the

the Little Bear. The outermoſt Circle is divided into 29 days and a half, being the *Moon's* Age; the innermoſt into 24 Hours; the Index belonging to the Bear you intend to obſerve by, is to be ſet to the Day of the *Month* at pleaſure.

The third, and uppermoſt Part, is a long Index; the Edge of which (that reſpects the Center) muſt be turned to the Guards, or Pointers in time of Obſervation.

To find the Hour of the Night, and upon what Point of the Compaſs the Guards are.

The Figure of the Nocturnal.



To do this, Firſt, ſet the Index of the middle Part to the Day of the Month; then hold the Inſtrument upright, which may be diſcerned by the Tip of the Top of the *Nocturnal*, then look through the Hole in the middle of the *Nocturnal* for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you obſerve by the Little or Great Bear, then ſhall the edge of the Index (upon the innermoſt Circle of the middle Part) give the Hour of the Night.

Alſo in *Nocturnals*, made for both Bears, you have on the Backſide two Circles, marked at the Bottom, the outermoſt with *L*, and the innermoſt with *G*; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal*, as before directed, obſerve what Figures on the Back-ſide fall under the Edge of the long Index, in the Circle belonging to the Bear, by which you obſerve, and that is the Deg. and Min. that the Star is above or under the Pole, as is diſtinguiſhed by the Words *Abo.*&*Und.*

Example. I obſerve by the *Great Bear*, *Sept. 6*, I ſet the Index marked *G*, to *Sept. 6*, and looking thro' the Hole to the Pole, I turn the long Index till it lie juſt over the 2 Pointers, as you ſee in the Figure of the *Nocturnal*, and find on the innermoſt Circle of the middle part of the *Nocturnal*, that it is 2 a Clock in the Morning; and on the Back-ſide in the Circle marked *G*, I find the Pole Star is 2 deg. 26 min. above the Pole, &c. 'Tis found alſo by the following Table.

To find the Moon's Southing, and Time of Full-Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermoſt Circle find the Moon's Age; and oppoſite to it in the innermoſt Circle of the ſame Piece ſtands the Southing.

Ex. Suppoſe the *Moon* 25 days old, and the time of her Southing requir'd Look for 25, the *Moon's* Age in the outermoſt Circle, oppoſite to which in the innermoſt Circle ſtands 8, which is the *Moon's* Southing at 25 days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Evening, but after the Full in the Morning.

Thus having found the *Moon's* Southing, add thereto the Time of Flowing upon the Full and Change-days at any Place, and that gives the time of Full-Sea when required. But this hath been ſufficiently ſhewed in another Place, therefore needs no Example.

The Uſe of the following Table of the Declination of the North-Star.

THE Uſe of the Table is this; Having taken the Alt. of the Pole Star, then obſerve with the *Nocturnal* upon what Point of the Compaſs the Guards are; oppoſite to which in this Table ſtands the Declination (ſo called;) which if the Star be below the Pole, is to be added to the Alt, but if the Star be above the Pole, to be ſubtracted therefrom to find the Latitude of the Place.

But the more exact way to find the Latitude, is by thoſe other Directions for the Stars before given.

A Table of the Declination of the North Star, *upon every Point of the Compaſs the Guards are upon, fitted for both ſorts of Nocturnals.*

	Points of the Compaſs.	For the Guard of the Little Bear.			For the Guards of the Gaeat Bear, called the two Pointers.			
		D.	M.			D.	M.	
If the former of the Guards be Aſcending from the North or lower Part of the Meridian.	North.	2	09	Above the Pole.	If the after Wheels, or two Pointers be aſcending from the North, or lower Part of the Merid.	2	20	Above the Pole.
	N. by E.	1	52			2	30	
	N. N. E.	1	29			2	35	
	N. E. by N.	1	02			2	33	
	N. E.	0	35			2	26	
	N. E. by E.	0	06			2	13	
	E. N. E.	0	22	The North Star is under the Pole.		1	55	
	E. by N.	0	52			1	33	
	Eaſt.	1	18			1	07	
	E by S.	1	41			0	38	
	E. S. E.	2	01			0	08	
	S. E. by E.	2	16			0	22	The North Star is under the Pole.
	South Eaſt.	2	15			0	52	
	S. E. by S.	2	30			1	20	
	S. S. E.	2	29			1	44	
	S. by E.	2	22			2	04	
If the former of the Gutards b deſcending, from the South, or upper Part of the Merid.	South.	2	11		If the two Pointers be deſcending from the South, or upper Part of the Merid.	2	20	
	S. by W.	1	55			2	30	
	S. S. W.	1	34			2	29	
	S. W. by S.	1	10			2	27	
	South Weſt.	0	43			2	23	
	S. W. by W.	0	14			2	13	
	W. S. W.	0	15	Above the Pole.		1	55	
	W. by S.	0	44			1	33	
	Weſt.	1	11			1	07	
	W. by N.	6	31			0	38	
	W. N. W.	1	58			0	08	
	N W by W.	2	14			0	22	Ab the Pole.
	North Weſt.	2	25			0	52	
	N. W. by N.	2	30			1	20	
	N. N. W.	2	29			1	44	
	N by W.	2	22			2	04	

A Table of the Latitude and Longitude of the Principal Harbours, Headlands, and Iſlands in the World: Corrected by the lateſt and beſt Obſervations: Accounting the Longitude from the Meridian of LONDON.

Note, *when the Latitude and Longitude of an Iſland is given, the the middle of the Iſland is meant, except ſome particular Part of it be expreſſed.*

Places Names.	Latitude N. or S. D.	M.		Longit. E. or W. D.	M.	
The Coaſt of England.						
Berwick ——	55	50		01	39W	
Newcaſtle —	54	58		01	30W	
Stockton ——	54	33		01	25W	
Spurn ——	53	35		00	30E	
Yarmonth ——	52	45		01	40E	
LONDON ——	51	32		00	00E	
North Foreland--	51	28		01	13E	
Beachy ——	50	48		00	25E	
Dunnoſe Iſle wight	50	38	North Latitude.	01	23	
Portland ——	50	30		02	48	
Start Point ——	50	09		02	45	
Lizard ——	49	55		05	14	
Lands-end ——	50	06		06	00	Weſt Longitude.
St. Mary's Scilly-	49	57		06	45	
Hartland Point --	51	06		04	35	
Lundy Iſle ——	51	20		04	40	
Briſtol ——	51	32		02	35	
St. Davids head--	51	55		05	22	
Barſey Iſle ——	52	46		04	58	
Holy-head ——	53	23		04	40	
Leverpool ——	53	20		02	58	
White-haven ——	54	25		03	15	
Carliſle ——	54	45		02	25	
The Coaſt of Scotland.						
Glaſcow ——	[illegible]5	53N		04	05W	
N. part of Sky Iſlan	57	50N		05	21W	

Places Names.	Latitude N. or S. D.	M.		Longit. E. or W. D.	M.	
North part of Lewis-Iſland	58	20		07	15	
St. Kilda ——	58	02	North Latitude.	10	05	Weſt Longitude.
Farra-head ——	58	23		05	05	
Northermoſt Iſles of Orkney	59	13		03	30	
Shetland S. Point	59	52		01	30	
Buchaneſs ——	57	55		01	20	
Aberdeen ——	57	24		01	37	
Dundee ——	56	30		02	36	
Edenburgh ——	55	57		02	46	
The Coaſt of Ireland.						
Dublin ——	53	20		07	06	
Wexford ——	52	13		07	16	
Waterford ——	52	07	North Latitude.	07	52	Weſt Longitude.
Cork ——	51	49		09	30	
Cape Clear ——	51	10		10	30	
Limrick ——	52	22		09	48	
Galway ——	53	10		10	03	
Sline-head ——	53	20		11	15	
London derry —	54	55		08	00	
Belfaſt ——	54	36		06	50	
The Coaſt of Holland and Flanders.						
Scaw ——	57	26N		10	10E	
Helighland ——	54	28N		08	35E Ham.	

Places Names.	Latitude N. or S.			Longit. E. or W.		
	D.	M.		D.	M.	
Hambrough	53	41	North Latitude.	10	24	Eaſt Longitude.
Emden	53	05		08	00	
The Fly	53	18		05	35	
The Texel	53	10		04	59	
Amſterdam	52	21		04	51	
Rotterdam	51	55		04	21	
The Brill	51	56		04	10	
Sluyce	51	19		03	50	
Calice	50	57		02	00	
The Coaſt of France and Portugal.						
Diep	49	56	North Lattitude.	01	06	Weſt Longitude.
Cape de Hague	49	46		02	06	
Caskets	49	50		02	32	
Guernſey	49	36		02	40	
Morlaix	48	37		03	50	
Uſhant	48	30		05	05	
Breſt	48	23		04	24	
Pennmark	47	48		04	15	
Bell-Iſle	47	20		03	10	
Nantz	47	14		01	49	
Iſland Dieu	46	40		02	15	
Iſland Ree	46	13		01	30	
Rochel	46	10		01	14	
Bourdeaux	44	50		00	24	
Bilboa	43	30		03	00	
Cape Ortegal	44	02		07	40	
Cape Finiſter	43	06		10	00	
Port a Port	41	18		09	20	
Burlings	39	39		10	15	
Rock of Lisbon	38	54		10	20	
Cape St. Vincent	37	00		09	32	
Cadiz	36	16		07	00	
C. Trefalgar	36	10		06	30	
The Coaſt on the Main Continent within the Straits.						
Gibralter	36	11N		05	43W	
Cape de Gat	37	03N		02	02W	

Places Names.	Latitude N. or S.			Longit. E. or W.		
	D.	M.		D.	M.	
Cape Paul	37	58	North Latitude.	00	22W	Eaſt Longitude.
Cape Martin	39	00		00	28	
Barcelona	41	30		02	21	
Marſeilles	43	20		05	15	
Toulon	43	06		05	40	
Genoa	44	25		08	40	
Leghorn	43	18		10	29	
Rome	41	51		12	28	
Naples	41	05		14	28	
Cape Spartavento	38	00		16	58	
C. Collone	39	10		18	00	
Gallipoli	40	08		18	39	
Cape St. Mary	39	56		19	00	
Ancona	43	31		14	40	
Venice	45	18		13	10	
Lepanto	38	20		21	55	
C. Matapan	36	35		22	20	
C. S. Angelo	36	41		23	20	
Athens	38	00		24	29	
Cape Martelo S. P. of Negropont	38	00		25	45	
C. Monte Sancto	40	05		26	05	
Gallipoli	40	30		27	58	
Conſtantinople	41	07		30	00	
Smyrna	38	30		27	27	
Epheſus	37	54		27	15	
Antiochetta	36	40		31	37	
Scanderoon	36	00		35	58	
Tripoli	34	40		35	50	
Alexandria	31	07		30	40	
C. Ruſato	33	15		21	55	
C. Miſorato	32	43		16	23	
Tripoli	32	55		13	00	
C. Bona	37	05		10	00	
Bona	37	00		07	00	
Algier	36	40		03	05	
Cape de tres forcas	35	34		01	25W	

Tetuan

Places Names.	Latitude N. or S.			Longit. E. or W.		
	D.	M.		D.	M.	
Tetuan	35	28N		5	52W	
Seuta	35	55N		5	47W	
Tangier	35	55N		6	14W	
Iſlands within the Straits.						
Alboran	36	10	North Latitude.	3	00W	East Longitude.
Formentara	38	44		1	31	
Yvica	39	5		1	30	
Majorca City	39	48		2	49	
Port Maon Minorca	40	02		4	25	
Gallitta	37	40		8	34	
Sardinia S. end	39	12		8	34	
Corſica N. end	42	57		9	45	
Gorgona	43	34		9	38	
Captia	43	06		9	40	
Lilboa	42	44		10	5	
Meſſina	38	22		16	25	
Maritimo	38	12		11	55	
C. Paſſero	36	48		16	4	
Malta	36	10		14	49	
Corfu	39	45		20	42	
Cephalonia	38	15		21	49	
Zant	37	47		22	10	
Modon on Morea	36	52		21	32	
Lemnos	39	50		25	27	
Scio	38	20		23	31	
C. St. John, Weſt end of Candy	35	20		23	27	
C. Solomon, Eaſt end of Candy	35	25		26	31	
Rhodes City	36	40		28	00	
Weſt end of Cyprus	35	21		31	35	
Eaſt end of Cyprus	35	35		34	25	
The Coaſt of Barbary and Guiney.						
C. Spartell	35	46	North Latitude.	5	55	Weſt Longitude.
Salle	33	43		6	30	
C. Cantin	32	16		9	20	
C. de Geer	30	4		10	10	
C. Bajador	26	12		14	30	
C. Olerado	23	41		15	50	
C. Blanco	20	35		16	55	
Senegal	15	16		15	40	

Places Names.	Latitude N. or S.			Longit. E. or W.		
	D.	M.		D.	M.	
Cape de Verd	14	30	North Latitude.	16	26	Weſt Longitude.
River Gambia	13	16		15	20	
Serralion	8	36		12	15	
Monſerado	6	5		9	20	
Cape Palmos	4	3		5	36	
Jaque Jaque	4	16		2	30	
Aſſene	4	15		1	00	
Cape 3 Points	4	13		0	45	Eaſt Longitude.
River Volto	5	40		3	30	
River Formoſa	7	00		7	40	
Cape Formoſa	4	40		8	00	
New Callabar	4	12		10	25	
Old Callabar	4	18		11	32	
River Camarones	4	2		13	10	
River de Angra	0	49		13	15	
Lopas	1	5	South Lat.	12	20	
River Congo	5	45		15	25	
Angola	8	51		15	56	
Cape Negro	16	08		14	46	
C. St. Thomas	23	10		14	23	
Secos	28	56		15	32	
CapeBona Eſperance	34	25		17	25	
Weſtern Iſlands.						
Corvo	40	5	North Latitude.	29	55	Weſt Longitude.
Flores	39	40		29	50	
Fyal	38	53		27	16	
Pico	38	32		26	31	
St. George	38	56		26	10	
Tercera	38	53		24	42	
St. Michael	38	00		22	32	
St. Maryes	37	00		22	17	
The Canary Iſlands-						
Ferro	28	0	North Latitude.	18	12	Weſt Longitue.
Palma	28	50		18	0	
Gomero	28	8		17	26	
Tenarif	28	20		16	45	
Madera Weſt-end	32	17		17	22	
Porto Sancto	32	50		15	50	
Canaria	27	56		15	30	
Fortaventura	27	54		13	24	
Lancerota	28	32		12	54	

Places Names.	Latitude N. or S.	Longit. E. or W.
Cape de Verd Iſlands.	D. M. North Latitude.	D. M. Weſt Longitude.
St. Antonio	17 10	25 20
St. Vincent	16 55	25 10
St. Lucia	16 45	24 58
St. Nicholas	16 40	24 22
Brava	14 35	24 38
Fuogo	14 42	24 00
Java	15 20	23 10
Iſle of May	15 16	22 12
Iſle Sal	16 45	22 02
Bonaviſta	16 05	21 55
Southern Iſlands.		
St. Matthews	01 40S	03 55W
Aſcenſion	8 10S	12 35W
St Helena	16 06S	05 40W
Farnandepo	02 35N	11 55E
Princeps	01 25N	11 00E
St. Thomas	0 00---	09 58E
Annabona	01 22S	09 28E
The Coaſt of the Main Continent in the Eaſt Indies.	North Latitude.	Eaſt Longitude.
C.BonaEſperance	34 25S	17 25
Cape Lagullus	35 35S	18 40
Cape Corientes	23 52S	35 35
Moſambique	15 05S	40 30
River de Fugos	00 00	41 15
Cape Baſſos	04 00	49 50
Cape Guardafoy	11 50	52 30
Cape Roſulgat	22 27	60 45
Cape Muca	26 56	57 10
Buſſera	30 00	49 05
Surrat	21 08	73 25
Goa	15 22	74 37
Calecute	11 17	75 54
Cochin	09 58	76 45
Cape Comarine	07 50	78 25
Fort St. George	13 08	81 42

Places Names.	Latitude N. or S.	Longit. E. or W
	D. M. North Latitude.	D. M.
Dew Point	15 50	82 05E
Viſegapatam	17 40	85 07E
C. Palmires	20 45	88 10E
Bengal	22 27	91 49E
C. Negrais	16 23	93 05E
Malacca	02 21	101 20E
Siam Entrance	13 10	101 01E
Cambodia Entrance	10 30	105 20E
Cochin	18 25	103 58E
Cantam	23 30	113 20E
Amoy or Quemoy	24 35	116 55E
Lampo	30 10	120 25E
Nanquim	32 55	120 05E
Iſlands in the Eaſt Indies.	North Latitude. South Latit.	Eaſt Longitude.
Madagaſ.or St.Laur. S.end	26 06	46 20
Nend	12 10	50 10
Mayetta	13 10	45 45
Mohilla	12 15	43 41
Comero	11 50	43 44
St. Juan de Nova	17 30	42 35
Mauritias	20 05	55 05
Digo Royes	19 45	61 35
Romiras de Caſte Lamos	29 05	66 56
Amſterdam	39 50	74 24
St. Brandon	16 38	64 30
Digo Gratioſa	08 42	69 05
Quabella	03 49	52 39
Baſſos de Chagos	05 05	70 25
Yas de Digo Rays	00 00	72 05
Maldivia N.end	07 05	73 05
S. end	01 00	76 15
Malique	09 00	73 15
Saccatra	12 28	55 37
Abdeleur	12 10	54 23
C.Gallo inZeloan	06 07	80 45

Yas

Places Names.	Latitude N. or S.			Longit. E. or W.		
	D.	M.		D.	M.	
Yas de Amber	0	0	North Lat.	52	30	East Longitude.
Andaman	13	0		91	25	
Nicobor	7	5		92	55	
Sumatra *N. W.* end	5	28		93	45	
Verkins Iſland	2	22		94	7	
Nauſſau Iſland	2	44	South Latitude.	98	32	
Bencola	3	50		101	13	
Sumatra S. E. end	5	42		104	4	
Engano	5	40		100	53	
Selam	8	20		102	13	
Princes Iſland	6	30		104	2	
Bantam on Java	5	47		105	11	
Batavia	5	37		106	27	
Java Eaſt-end	8	35		112	27	
Straits of Sundy	5	52		104	18	
Banca S. end	3	25		106	37	
Borneo S. point	4	14		112	52	
Bandy Iſles	5	5		126	37	
Celebes South end	6	0		117	27	
Celebes Northend	1	40	North Latitude.	121	30	
Mindano W. point	6	30		118	35	
Borneo *N.* point	7	10		112	45	
Luconio S. point	12	30		120	50	
Luconio *N. E.* p.	18	35		119	5	
Anaini W. point	19	30		108	6	
Anaini E. point	19	55		111	16	
Formosa S. point	22	00		119	30	
Formosa N. point	25	32		120	25	
Piſcadore Iſles	23	30		117	35	
Iſland Chuſan	30	38		120	35	
Japan S. E. point	39	50		135	15	
Japan S. W. point	39	10		126	55	

The Coaſt of America in the South Sea from Callifornia to Cape Horn.

Places Names.	Latitude N. or S			Longit. E. or W		
				M.	D.	
Cape St. Sebaſtian	42	40	North Lat.	129	55	West Longit.
Cape St. Luca	23	25		111	56	
Cape Corientes	19	40		110	30	
Aquapulco	17	00		106	28	
Aquatulco	15	27		101	3	
Guatimala	14	25		96	0	
Panama	8	56		82	18	
Bay Bonaventuro	3	28	South Latitude.	80	6	West Longitude.
Iſlands of Gallopega	0	0		90	10	
Cape del Ajugo	16	38		88	50	
Cima	12	30		73	30	
Arica	18	12		74	10	
La Serena	24	40		76	32	
Iſland Juan Fernando	33	20		86	48	
Baldivia	39	35		81	20	
Port Steven	46	50		82	36	
Cape Victory	52	15		83	20	
Cape Horn	57	58		79	55	

The Coaſt of Brazile in South America from Cape Horn to Cape *Roque.*

Places Names.	Latitude N. or S			Longit. E. or W		
Magellen E. entrance	51	58	South Latitude.	75	30	West Longitude.
River Julian	48	40		74	32	
Cape Blanco near River Carmarones	46	50		72	5	
Buenas Aries R. Plata	36	10		57	30	
River Grand	31	55		51	40	
St. Katherines	28	0		47	50	
Cape Frio	23	10		42	56	
Spirito Sancto	19	58		42	0	
P. Segura	16	22		40	58	
Bay Todus Sanctus	13	0		40	35	
R. St. Franciſco	10	55		37	46	
Cape St. Auguſtine	8	5		35	38	
Cape Roque	5	0		35	52	
Triſtan de Cunha	37	5		15	38	
Trinidada	0	30		30	0	

The Coaſt of the Main Continent in the Weſt Indies.

Places Names.	Latitude N. or S			Longit. E. or W		
R. Amazones Entr.	0	0	North Latitude.	49	0	Weſt Longitude.
North Cape	2	5		49	55	
Surnam	6	0		56	55	
Oronoque	8	15		59	5	
C. Coquibaca	12	50		70	40	
Catagene	10	50		75	50	
Scots Settlement	8	30		78	45	
Nicaraque Entrance	11	15		85	5	
Cape Catocha	21	22		88	55	

Places Names.	Latitude N. or S.		Longit. E. or W.	
	D.	M.	D.	M.
Campeche	19	20N	93	05W
La vera Cruz	19	15N	100	25W
Eſcondide	18	20N	99	00W
Cape Florida	24	48N	81	55W
The Caribbe Iſlands.	North Latitude		West Longitude.	
Trinadada	10	05	60	05
Tobago	11	10	59	20
Granada	12	07	60	30
Barbadoes	13	10	58	03
St. Vincent	13	12	59	22
St. Lucia	13	52	59	17
Martinico	14	48	58	25
Dominico	15	35	58	27
Marigalante	15	53	58	20
Guardalupa	16	15	59	23
Monſerat	16	40	59	35
Antegoa	17	00	59	21
Nevis	17	06	60	18
St. Chriſtophers	17	22	60	35
Barbuda	17	43	59	25
St. Bartholomew	17	54	60	45
St. Martins	18	05	60	49
Anguilla	18	13	60	55
Virgins	18	23	62	22
St. Cruz.	17	38	62	35
Bieque	18	00	63	15
PortRico St. Johns	18	33	64	20
St. Domin. Hiſpan.	18	15	68	50
P. Royal Jamaica	18	00	77	03
Eaſt end of Cuba	20	20	74	05
Havana	22	50	83	30
Bay Honda	22	35	84	40
C. St. Antonia	21	50	86	32
Bahama Iſlands.				
Bermudus	32	30N	61	30W
BahamaBank N. Point	28	22N	78	15W

Places Name.	Latitude N. or S.		Longit. E. or W.	
	D.	M.	D.	M.
	North Latitude.		West Longitude.	
Bahama Iſland	27	05	78	58
Abacco S. Point	25	50	77	20
Harbour Iſland	25	40	76	35
Androſs N. Point	25	15	79	00
Providence	25	00	77	45
Illathera S. Point	24	30	76	12
Cat Iſland	24	25	75	20
Watling Iſland	24	07	74	50
Rum Key	23	45	75	05
Exuma	23	25	76	07
Crooked Iſle N. Point.	23	03	74	00
Atkins Key	22	00	74	15
Merapervouz	21	57	74	40
Atwoods Keys	23	09	73	30
French Keys	22	40	73	35
Mayaguana	22	35	73	00
Hogſtyes	21	15	73	50
Hyneago	20	57	73	20
Cancos bank N. Point	21	50	71	15
Turks Iſland	21	35	70	08
Abrolho N. Point	21	40	68	40
Plate wrack	20	03	[illegible]	10
The Coaſt of Carolina, Virginia, Mary-Land, Penſilvania, New-England, and New-found-land.	North Latitude.			
Charles Town upon Aſhly Riv.	32	40	78	50W
Cape Hateras	35	10	74	25W
Cape Henry	37	00	74	30W
Cape Charles	37	14	74	15W
Cape Hinloper	39	04	73	25W
Long Iſland	40	50	70	40W
New York	41	00	72	05W

Cape

Places Names.	Latitude N. or S.		Longit. E. or W.	
	D.	M.	D.	M.
	North Latitude.		West Longitude.	
Cape Cod	42	10	67	45
Boſton	42	35	68	50
Cape Sable	43	45	63	25.
Iſland Sable	44	30	59	5
Cape Britain	46	20	58	15
Quebeck	47	15	68	10
Bay of Breſt	52	10	55	0
Bell-Iſland	52	5	54	10
Cape St. John	50	9	52	35
Cape Bonaviſta	49	11	52	3
Trinity-bay	48	27	52	15
Conception-bay	47	53	52	0
St. John's Harb.	47	28	51	25
Bay of Bulls	47	40	51	6
Cape Raze	46	30	51	25
Cape St. Mary	47	10	53	20
Placentia	47	57	53	0
Cape Roy	48	21	57	15

The Coaſt of Hudſon's Bay and Straits.

Places Names.	Latitude N. or S.		Longit. E. or W.	
	North Latitude.		West Longitude.	
Buttons Iſle	60	5	66	50
Cape Charles	62	35	75	20
C. Walſingham	63	15	77	40
Mansfield Iſle	62	20	80	50
Cape Jones	55	3	79	15
Ruperts River	51	16	79	55
Albany River	52	32	84	7
The Cubbs	54	15	82	0
C. Henrietta Maria	55	5	84	2
Port Nelſon	57	5	92	47
Cape Churchil	59	0	92	57
C. Southampton	61	57	88	30
Shark Point	64	27	83	20
Nottingham Iſle	63	38	79	47
Q. Anns Foreland	63	32	73	57
Reſolution Iſle	61	55	65	50
Cape Farewell	59	10	46	35

The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.

Places Names.	Latitude N. or S.		Longit. E. or W.	
	D.	M.	D.	M.
	North Latitude.		East Longitude.	
Sound Royal	66	22	14	15
Bargazar Point	66	30	11	12
Whales Back	65	27	10	5
Merch. Foreland	63	20	14	5
Halliford	64	30	24	15
Fair Foreland	65	10	26	45
Grims Iſland	66	51	17	45
Weſtmania Iſles	63	55	18	10
Iſles of Fero	62	6	5	0
Beerenberg, or John Mayns I.	71	45	4	30
Point Look out	76	40	16	25
Horn-ſound	77	23	14	20
Fair Foreland	79	18	10	50
Hacluits Headland	79	55	12	0
Helies Sound	79	15	12	5
Lees Foreland	78	5	23	25
Whales-head	77	18	21	30
Hope Iſland	76	22	22	0
Cherry or Bear Iſl.	74	35	18	5
Admiralty Iſland	75	5	59	50
Fretum Borrough	69	55	62	5
Cape Candenoſe	69	27	42	30
Catſnoſe	65	43	35	14
Archangel-bar	65	5	35	30
Croſs-Iſland	66	31	36	33
Sweetſnoſe	68	8	34	42
Kilduyn	69	32	30	15
North Cape	71	25	22	0
Surroy	71	5	18	40
Tromſound	70	18	16	0
Loefort S. W. point	67	47	9	35
Dronton	64	0	10	40
Standland	62	10	4	38
North-bergen	60	16	5	40
Naze of Norway	57	50	7	22

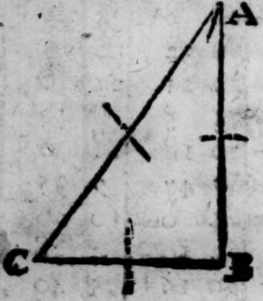
Places Names.	Latitude N. or S.		Longit. E. or W.		Places Names.	Latitude N. or S.		Longit. E. or W.	
Sea-Coaſt in the Sound, and Baltick Sea.	D.	M.	D.	M.		D.	M.	D.	M.
	North Latitude.		Weſt Longitude.			North Latitude.		Eaſt Longitude.	
Mordou	58	25	09	05	Revel	59	00	24	45
Larwick	58	54	09	20	Riga	56	50	24	50
Chriſtiana	59	10	09	45	Derwinda	57	20	22	00
Maeſterland	57	58	11	45	Conningsberg	55	00	20	20
Gottenberg	57	33	12	25	Dantzick	54	22	19	00
Elſinor	56	00	12	32	Wisbuy in Gotland	57	37	18	50
Copenhagen	55	44	12	35	Bornholm	55	27	14	53
Valſteborn	55	20	12	55	Straelſound	54	45	13	20
Kalmer	56	40	16	40	Lubeck	54	25	11	05
Stockholm	59	20	18	25	Anout	56	42	10	58
Wyborg	60	20	29	26	Leſou	57	05	10	40
Petersberg	59	25	29	50	Scaw	57	26	10	10
Narve	58	39	28	14					

Problems of Plain Sailing, wrought by the Logarithms *and by* Gunter's Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſail South-weſt by South, 382 Minutes, and it be required to find the Difference of Latitude and Departure.



In the Triangle ABC.

AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe,
ACB (or the Angle at C) the Complement of the Courſe to 90°

Characters uſed in Navigation *and* Aſtronomy.

S. ſtands for Sine,
T. for Tangent.
Sc. Sine Complement. Tc. Tangen Complement.
The given Sides and Angles of a Triangle are marked with a Daſh thus (′.)
The required Sides and Angles with Pricks thus (......)

The Operation by the Dogarithms. *For the Difference of Latitude.*

As Radius	10.000000
To the Diſtance ſailed 382	2.582063
So is Sc. of the Courſe 33° 45′	9.919846
To the Difference of Latitude 317 required	12.501909

For the Departure.

As Radius	10.000000
To the Diſtance ſailed 382	2.582063
So is the S. of the Courſes 33° 45′	9.744739
To the Departure which is 212	12.326802

The Operation by Gunter's *Scale.*

For the Difference of Latitude.

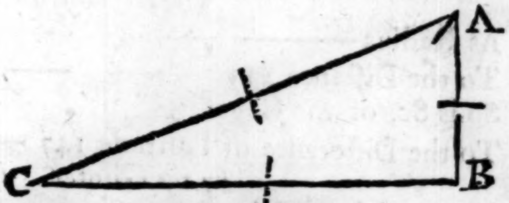
One Foot of the Compaſſes being in the Radius (or Sine of 90 Deg.) extend the other to the Sine 56° 15′ the Complement of the Courſe, and the ſame Extent ſhall reach the ſame way (*viz.* decreaſing) from the Diſtance 382, to the Difference of Latitude 317.

For the Departure.

The Extent of the Compaſſes from the Radius (or Sine of 90 deg) to the Sine of the Courſe 33° 45′, the ſame Extent ſhall reach the ſame way from the diſtance 382, to the departure 212.

PROB. II. The Courſe and difference of Latitude given, to find the Diſtance and Departure.

Suppoſe a Ship ſail W. S W. until the Difference of Latitude be 219, and the Diſtance and Departure required.



The Operation by the Logarithms. *For the Diſtance.*

As Sc. of the Courſe 67° 30′	9.582840
To the Difference of the Latitude 219	2.340444
So is Radius	10.000000
To the Diſtance which is 572	2.757604

For the Departure.

As Radius — — — — — — — 10,000000
To the Diſtance 572 — — — — — — 2.757396
So is the Sine of the Courſe 67° 30′ — — — — 9.965615
To the Departure, 528 — — — — — — 12.723011

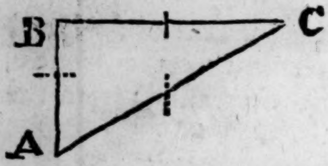
By the Gunter.

For the Diſtance. The Compaſſes being extended from the S. of 22° 30′ the Complement of the Courſe to the Radius, the ſame extent ſhall reach the ſame way (*viz.* increaſing) from the Difference of Latitude 219, to the Diſtance, which is 572.

For the Departure.

The Extent of the Compaſſes from Radius to the *S.* of the Courſe 67° 30′ ſhall reach (the ſame way) from the Diſtance 572, to the Departure 528.

PROB. III. The Courſe and Departure given, to find the Diſtance and Difference of Latitude.



Suppoſe a Ship ſail North-Eaſt by Eaſt, untill the Departure be 220, the Diſtance and Difference of Latitude required.

By the Logarithms. *For the Diſtance.*

As *S.* of the Courſe 56° 15′ — — — — — 9.919846
To the Departure 220 — — — — — — 2.342422
So is Radius — — — — — — — 10.000000
To the Diſtance 265 — — — — — — 12.422576

For the Difference of Latitude.

As Radius — — — — — — — 10.000000
To the Diſtance 265 — — — — — — 2.423246
So is Sc. of the Courſe 56° 15′ — — — — 9.744739
To the Difference of Latitude 147 — — — — 12.167985

By the Gunter. *For the Diſtance.*

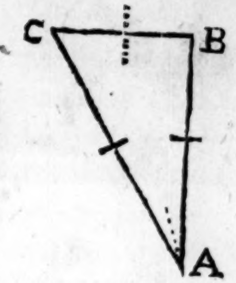
The Extent of the Compaſſes from the S of the Courſe 56° 15′, to the Radius, ſhall reach (the ſame way) from the Departure 220, to the Diſtance 265.

For the Difference of Latitude.

The Extent of the Compaſſes from Radius to the S. of 33° 45′, the Complement of the Courſe ſhall reach from the Diſtance 265, to the Difference of Latitude, 147 required.

PROB. IV. The Diſtance and Difference of Latitude given, to find the Courſe and Departure.

Sup-



Suppoſe a Ship ſail between the North and the Weſt 206 Miles until the Difference of Latitude be 197, the Courſe and Departure required.

By the Logarithms. *For the Courſe.*

As the Diſtance 206	2.313867
To the Radius	10.000000
So is the Difference of Latitude, 197	2.294466
To the Sc. of the Courſe; which is N. 17° 00′ W.	9980599

For the Departure.

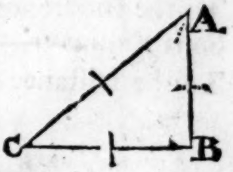
As Radius	10.000000
To the Diſtance 206	2.313867
So is the S. of the Courſe 17° 00′	9.465635
To the Departure 60	11.779802

By the Gunter.

For the Courſe. The Extent from the Diſtance 206, to the Difference of Latitude 197, ſhall reach from Radius, to the S. of 73 deg. 00 min the Complement of the Courſe, which ſubtracted from 90 deg. is the Courſe required.

For the Departure. The Extent from Radius or S. 90 deg. to the S. of the Courſe 17 deg. 00 min. ſhall reach from the Diſtance 206, to the Departure 60 required.

PROB. V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.



Suppoſe a Ship ſails between the South and the Weſt 247 Minutes, until the Departure be 197, and it be required to find the Courſe and Difference of Latitude.

The Operation by the Logarithms. *For the Courſe.*

As the Diſtance 247	2.392697
To Radius	10.000000
So is the Departure 197	2.294466
To the S. of the Courſe 52 deg. 52 min.	9.901769

For the Difference of Latitude.

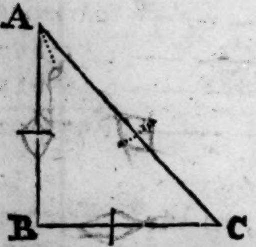
As Radius	10.900000
To the Diſtance 247	2.392697
So is Sc. of the Courſe 52 deg. 54 min.	9.780467
To the Difference of Latitude, 149	12.173164

By the Gunter.

For the Courſe. The Extent of the Compaſſes for the Diſtance 247, to the Departure 197. ſhall reach the ſame way from Radius or S. 90 deg to the S. of the Courſe, 52 deg. 54 min.

For the Difference of Latitude. The Extent from Radius or S. 90 deg. to the S. 37 deg. 06 min. the Complement of the Courſe, will reach from the Diſtance 247, to the Difference of Latitude, 149.

PROB. VI. The Difference of Latitude and Departure given; to find the Courſe and Diſtance.



Suppoſe a Ship ſail between the South and Weſt until her Difference of Latitude be 154, her Departure 200, and it be equired to find the Courſe and Diſtance.

The Operation by the Logarithms. *For the Courſe.*

As the Difference of Latitude 154	2.187521
To Radius	10.000000
So is the Departure 200	2.301030
To the T. of the Courſe 52 deg, 24 min. required	10.113509

For the Diſtance.

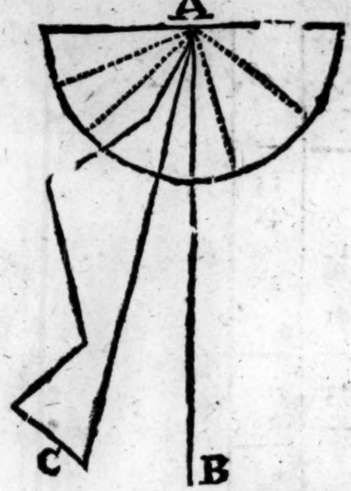
As the Sc. of the Courſe 52 deg. 24 min.	9.785433
To the Difference of Latitude 154	2.187521
So is Radius	10,000000
To the Diſtance 252	2.402088

By the Gunter.

For the Courſe. The Extent of the Compaſſes from the Difference of Latitude 154, to the Departure 200, ſhall reach from Radius in the Tangents (which is the Tangent of 45 deg.) to the Tangent of the Courſe, 52 deg. 24 min.

For the Diſtance. The Extent from the S. of 37 deg. 36 min. the Complement of the Courſe to the Radius, or the S. of 90 deg. will reach from the Difference of Latitude 154, to the Diſtance 252.

PROB.



PROB. VII.

This Problem ſhews the manner of working a Traverſe, and is very uſeful in keepin a Reckoning by Plain Sailing.

Example.

Suppoſe a Ship bound to a certain Port, and ſhe ſails firſt S. S. W. 40 min. then S. W. 60 min. then S. by E. 63 min. W. S. W. 49. min. then S. E. by S. 56 min. and the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance required.

The Operation. By the Logarithms.

For the Difference of Latitude of the firſt Courſe.

As Radius ——————————— 10.000000
To the Diſtance 40 ——————————— 1.602060
So is Sc. of the the Courſe 22° 30′ ——————— 9.965615
To the Difference of Latitude, 36 ——————— 11.567675

For the Departure of the firſt Courſe.

As Radius ——————————— 10.000000
To the Diſtance 40 ——————————— 1.602060
So is the S of the Courſe 22° 30′ ——————— 9.582839
To the Departure 15 required ——————— 11.184899

By the Gunter.

For the Difference of Latitude.

The Extent of the Compaſſes from Radius or S. 90° to the S. of 67° 30′ the Complement of the Courſe, will reach from the Diſtance 40, to the Difference of Latitude, 36 required.

For the Departure.

The *E*xtent from Radius or S. 90 deg. to the S. of the Courſe 22d. 30 min. ſhall reach from the Diſtance 40, to the Departure 15 required.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

The Traverſe Table.

Courſes.	*Diſtance.*	*North*	*South*	*Eaſt.*	*Weſt.*
S. W.	40		36		15
S. W.	60		42		42
S. by E.	63		61	12	
W. S. W.	49		19		45
S. E. by S.	56		47	31	
			205	43	102
					43
					59

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, obſerve, that if the Courſe be Northerly the Difference of Latitude is put in the North Column; if it be South, in the South Column; and if the Courſe be Eaſterly, the Departure is put in the Eaſt Column; if Weſterly in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the difference of Latitude appears to be 203 Minutes South, becauſe there is nothing in the North Column; the Departure 59 Minutes Weſt, becauſe ſo much the Weſt Column exceeds the Eaſt: By which Difference of Latitnde and Departure, find the direct Courſe and Diſtance as follows.

The Operation for the Logarithms. *For the direct Courſe.*

As the Difference of Latitude, 205 ——— 2.311754
To Radius ——— 10.000000
So is the Departure 59 ——— 1.770852
To the T. of the Courſe 16° 3′ South Weſterly becauſe the South and Weſt Columns exceed the North and Eaſt ——— 9.459098

For the Diſtance.

As the Sc. of the Courſe 16° 3′ ——— 9.982733
To the Difference of Latitude 205 ——— 2.311754
So is Radius ——— 10.000000
To the Diſtance required 213 ——— 2.329021

By the Gunter. *For the direct Courſe.*

The Extent of the Compaſſes from the Difference of Latitude 205 to the Departure 59, ſhall reach from Tangent 45° (or Radius) to the Tangent of 16° 3′ the Courſe required.

For the Diſtance.

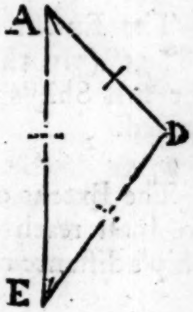
The Extent from S. 73 deg. 57 min. the Complement of the Courſe, to S. of 90 deg. (*viz.* Radius) ſhall reach from the Difference of Latitude 205 to the Diſtance 213 required.

Oblique-angled Plain Triangles, applied in PROBLEMS *of Plain Sailing, and wrought by the* Logarithms, *and* Gunter's *Scale.*

PROB. I. THE Angles and one of the Sides given, to find either of the other ſides.

Example.

Suppoſe there are two Ports both under one Meridian, A Ship ſails from the Northermoſt *South Eaſt* 206 Miles, another Ship ſails from the Southermoſt *North Eaſt* by *North*, a certain Number of Miles, and meets with the firſt ſhip: The diſtance between theſe two Ports, and the diſtance ſailed by the ſecond Ship is required.



In the Triangle ADE,

A and E repreſents the two Ports, AD the firſt Ship's diſtance. ED the ſecond Ship's diſtance, AE the diſtance between the two Ports.

The Operation by the Logarithms. *For the Diſtance between the two Ports,*

	Co. Ar.
As S. AED 33° 45′	0.255261
To AD the firſt Ship's diſtance 206′	2 313867
So is S. ADE 101° 15′	2.991573
To AE the diſtance between the two Ports 364	12 560701

In all Operations where Radius is not one of the three given Terms, to ſave the Labour of ſubtracting the firſt Logarithm from the Sum of the ſecond and third, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarith. Sine found in the Table is 9.7447390, wherefore beginning at the Left-hand ſay, 9 from 9, there remains 0; 7 from 9 remains 2; 4 from 9, there remains 5; 4 from 9, remains 5; 7 from 9 remains 2; 3 from 9 there remains 6; 9 from 10, remains 1. So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which add to the other two Logarithms, and from the Sum abate Radius, the Remainder is the Logarithm, Sine or Tangent required.

And *Note*, to find the Sine of any degree and minute above 90°, ſubtract the degree and minute from 180°, the Sine of the Remainder is the Sine required.

For the ſecond Ships Diſtance.

	Co. Ar.
As S. AED 33° 45′	0.255261
To AD the Firſt Ship's diſtance 206′	2.313867
So is S. DAE 45° 00′	9.849485
To DE the ſecond Ship's diſtance, 262 required	~~1~~2.418613

By the Gunter. *For the Diſtance between the two Ports.*

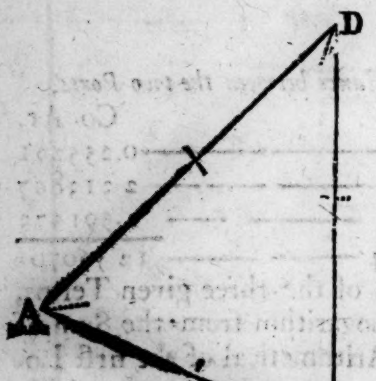
The Extent of the Compaſſes from S. of 33° 45′ to the S. ADE, 78° 45′ (*viz.* the Complement of 101° 15′ to 180°) ſhall reach from 206 the firſt Ship's diſtance, to 364 the diſtance between the two Ports required.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33° 45′ to the S. of 45° 00′ ſhall reach from 206, the firſt Ship's diſtance, to 262 the ſecond Ship's diſtance required.

PROB. II.

Two ſides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third ſide.



Example.

Suppoſe two Ports, whoſe Bearing is North-Eaſt and South-Weſt diſtant 396 Miles, a Ship at the Northermoſt ſails S. S. E. and another Ship at the Southmoſt ſails thence 518 Miles, and meets with the firſt Ship: The *Courſe* ſailed by the ſecond Ship, and the firſt Ship's diſtance are required

In the Triangle ADE.

A and D repreſent the two Ports.
AD the diſtance between them.
DE the diſtance ſailed by the firſt Ship.
AE the diſtance ſailed by the ſecond Ship.

The Operation by the Logarithms. *For the ſeeond Ships Courſe.* Co. Ar.
As AE the ſecond *Ship's* diſtance 518 ——————— 7.285671
To S. ADE 67° 30′ ——————— 9.965615
So is AD the diſtance between the two Ports 396 ——————— 2.597695
To S. AED 44° 56′ ——————— X9.848981

The Angle at D 67° 30′ and the Angle at E 44° 56′ being added together and Subtracted from 180° gives 67° 34′, the Angle at A, which makes neareſt 6 Points, and 6 Points reckoned from the *North Eaſt* to the *Southward* gives E.S.E. the ſecond *Ship's Courſe* required.

For the Firſt Ship's Diſtance.

Co. Ar.
As S. ADE 67° 30′ ——————— 0.034384
To AE the ſecond Ship's diſtance 518 ——————— 2.714329
So is S. DAE 67° 34′ ——————— 9.965824
To DE the firſt Ship's diſtance 518 required ——————— X2.714537

By the Gunter.

The Extent of the Compaſſes from the diſtance 518, to the diſtance between the two Ports 396, ſhall reach from S of 67° 30′ to S. 44° 56′, which added to the Angle at D, and the ſum ſubtracted from 180°, gives 76° 30′ the Angle at A.

For the firſt Ship's Diſtance. The extent from S. 67° 30′, to S. 67° 34′ ſhall reach from the ſecond *Ship's Diſtance* 518, to the firſt *Ship's Diſtance* 518 required.

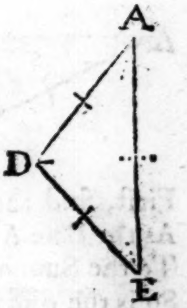
PROB. III.

Two ſides and the contained Angle given to find the other Angle.

Example.

Suppoſe two Ships ſail from one Port; one ſails N. E. 140 Miles, the other South-Eaſt by Eaſt 115 Miles, the bearing and diſtance of theſe two Ships is required.

Let D repreſent the Port, DA the firſt *Ship's Diſtance*, and DE the ſecond.



The *Operation by the* Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 ——— Co. Ar 7.593459
To the Differene of the ſaid Sides 25 ——— 1.397940
So is the T. of half the Sum of their oppoſite Angles 50° 37′ 10.085698
To the T of half their difference, which is 60° 48′ ——— ~~1~~9.077097

The half difference added to the half-ſum, gives 57° 25′, the greater Angle AED. The half difference ſubtracted from it, gives 43° 49′, the leſſer Angle DAE. Wherefore the Bearing of the two Ships is *N.E ly* or *South-Weſterly* 1° 11′.

For the Diſtance of the two Ships.

As S. AED 57 deg. 25 min. ——— Co. Ar. 0.074373
To AD the firſt Ship's diſtance 140 ——— 2.146128
So is S. ADE 78 d 45 min. ——— 9.991573
To AE the diſtance of the Ships, 163 *fere* ——— ~~1~~2.212074

By the Gunter. *For the Bearing of the Ships.*

The Extent of the Compaſſes from the ſum of the ſides 255, to their difference 25, ſhall reach from the T. of the half ſum of the required Angles 50d. 37m. to the T. of half the difference of the ſaid Angles 6d. 48m.

In the foregoing Operation by the *Gunter*, the Practitioner may be at a loſs, becauſe in extending the Compaſſes from the T. 50d 37m. decreaſing they will fall beyond the T. of 45d. at the end of the Line. To remedy this place the extent from 255 to 25, from the T. 45d. and it will reach to T. of 5.37; then letting one Point ſtand at 5.37. extend the other to the T. 50.37. this extent place from the T. of 45. ſhall fall on the T. 6. 48 required.

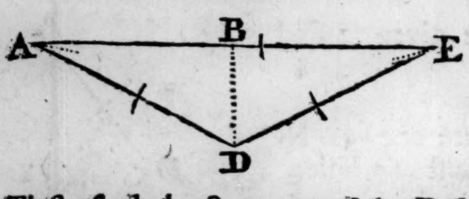
For the Diſtance of the Ships.

The extent from the S. of 57d. 25m. to the S. of 78d. 45m. ſhall reach from 140 to 163 required.

PROB. IV. Three ſides being given to find an Angle.

Example. Suppoſe there are two Ports both in one Latitude, diſtant 536 Miles, a Ship ſails from the Eaſtermoſt 306 Miles between the South and the Weſt: Another Ship ſails from the Weſtermoſt 290 Miles and meets with the firſt Ship. The Courſe that each Ship ſteer'd is required.

Let A and E repreſent the two Ports, D the Place where the Ships meet.



This Queſtion is reſolved by letting fall a Perpendicular DB; ſo reducing the Oblique Triangle ADE, into the Two right angled Triangles ABD and BDE, then the Operation is as follows.

First, find the Segment of the Baſe BE, thus. Co. Ar.

As the Baſe AE 526 ——— 7 270835
To the Sum of the ſides AD and ED 596 ——— 2.775246
So is the difference of the ſaid Sides 16 ——— 1.204120
To a Segment of the Baſe which is 18 ——— ~~1~~1.250201

The whole Baſe is ———————— 536
The Segment is ———————— 18

Sum ———————— 554
Half-ſum ———————— 277 the greater Segment BE.

Then ſay *For the firſt Ship's Courſe.*

As DE the firſt Ship's diſtance 306 ———————— 2.485721
To Radius ———————— 10.000000
So is the greater Segment BE 277 ———————— 2.442479
To Sc. BED 25° 9′ ———————— 9.956758

The Angle at E is the Courſe from the Weſt Southerly ſo the firſt Ship ſteers South 64° 51′ Weſt, or S W. by W. three quarters W. *fere.*

For the ſecond Ship's Courſe Co. Ar.

As AD the ſecond Ship's diſtance 290 ———————— 7.537602
To S. AED 25 deg. 9 min. ———————— 9.628378
So is DE the firſt Ship's diſtance 306 ———————— 2.485721
To S. DAE 26 deg. 39 min. ———————— 19.651701

The Angle at A is the Courſe from the Eaſt Southerly, ſo the ſecond Ship ſteers South 63 deg. 21 min. Eaſt, or S. E. by E. half E.

By the Gunter. *For the Segment of the Baſe.*

The Extent of the Compaſſes from the Baſe AE 506, to the ſum of the ſides 596, ſhall reach from the difference of the ſides 16, to the Segment of the Baſe 18, with which proceed as before.

For the firſt Ship's Courſe.

The extent from the diſtance 306, to the greater Segment 277, ſhall reach from Radius or S. 90 deg. to S. 64 deg. 51 min. the Compl. of BED 25 deg. 9 min required.

For the ſecond Ship's Courſe.

The Extent from 290 the ſecond Ship's diſtance, to 306 the firſt Ship's diſtance, ſhall reach from the S. 25 deg. 9 min. to the S. 26 deg. 39 min the Angle at A required.

PROB. V.

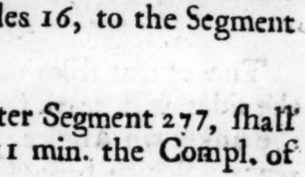
Two ſides and their contained Angle given, to find the third ſide.

Example.

Two Ship's ſail from one Port at A; The firſt ſails Eaſt 335 Miles to C, the ſecond ſails E. 14 deg. 40 min. North, 271 Miles to B. I demand how far they are aſunder and what is the Courſe from the Ship at C, to that at B.

In the Triangle ABC,
There is given,

AB 335
AC 271 } BC required.
BAC 14° 40′



This Caſe requires a double Operation:
1. By the 3*d* Caſe to find the Angles.
2. By the firſt Caſe to find the Side required,

The firſt Operation.

Co. Ar.
As the ſum of the Sides AB and AC *606* Log. ——— 7.217528
To their Difference ——— *64* ——— 1.806180
So is t. half ſum Angles ——— 82° 40′ ——— 1.0890440
To t. half their Difference ——— 39 22 ——— 19.914148

By which you will find the Angle ABC, to be 43 d. 18 m.

The ſecond Operation.

Co. Ar.
As S. ABC 43 d. 18 m. Log. ——— 0.163791
To Side AC 271 ——— 2.432969
So is S. BAC 14 d. 40 m. ——— 9.403455
To Side BC required, 100 ——— 12.000215

The Angle at B is found to be 43 deg. 18 min. therefore the line AB being Eaſt and Weſt, the Courſe from C to B is Eaſt 43 deg. 18 min. S. or S. E. 1 deg. 42 min. Eaſterly. And the Diſtance 100 Miles.

By the Gunter, *for the Angle at* B.

The extent from *606* the ſum of the ſides, To *64* the Difference of the ſides will reach from the Tangent of 82 d. 40 m. half the ſum of the unknown Angles; to the Tangent of 39 d. 22 m. half their Difference. Which being found, proceed as above to find the Angle at B.

Then the extent from S. 43 d. 18 m. the Angle at B, To S. of 14 d. 40 m. the Angle at A; will reach from 271 the ſide AC, To 100 the ſide BC required.

Thus much for ſailing by the *Plain Chart*; which being of ſome uſe in ſhort Voyages, and a good foundation for further Improvement, we were not willing wholly to omit it; but nevertheleſs would adviſe all that take charge of Ships, never to content themſelves with the uſe of the *Plain Chart* only, being ſo apparently falſe in it ſelf, and unſafe for practice: Nor are we under any neceſſity to truſt to it, the Defect thereof being now ſufficiently ſupplied by Mr. *Wright*'s True Sea-Chart, commonly called *Mercator*'s, the Projection and uſe of which (both in ſingle Queſtions and Traverſes) is largely Treated of and rendered as eaſy as the *Plain Chart*, in the Book called *Practical Navigation*, firſt ſet forth by Mr. *John Seller*, and now Corrected and Reprinted for Mr. *Mount* on *Tower-hill*, with many uſeful Additions.

A Large and very Uſeful

TABLE
OF
DIFFERENCE
OF
LATITUDE and DEPARTURE
IN
Minutes and Tenth Parts,
to every *Degree* and *Quarter Point*
OF THE
COMPASS:
For the Exact Working
OF A
TRAVERSE

London, Printed for *Rich. Mount*, at the Poſtern on
Tower-Hill.

A Table of DIFFERENCE

Dist.	1 Deg.		2 Deg.		¼ Point.		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	17.9	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	18.9	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	19.9	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	31.9	01.6	31.9	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	32.9	01.6	32.9	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	33.9	01.7	33.9	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	34.9	01.7	34.9	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	35.9	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.7	37.0	01.3	36.9	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	37.9	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	38.9	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	39.9	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	40.9	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.2	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.3	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.8	49.9	02.4	49.9	02.6	49.9	03.5	49.8	04.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Point.		87 Deg.		86 Deg		85 Deg.		

Dist.	1 Deg.		2 Deg.		¼ Point		3 Deg		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.5	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.6	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.9	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.1	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.8	04.1	58.8	05.2	59
60	60.0	01.0	60.0	02.1	59.9	02.9	59.9	03.1	59.8	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.8	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.3	61.8	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.4	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.7	05.7	65
66	66.0	01.1	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.9	67
68	68.0	01.2	67.9	02.4	67.9	03.3	67.9	03.6	67.8	04.8	67.7	05.9	68
69	69.0	01.2	68.9	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	69.9	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	70.9	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	71.9	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	72.9	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	73.9	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	74.9	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.6	75
76	76.0	01.3	75.9	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	76.9	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	77.9	02.7	77.9	03.8	77.9	04.1	77.8	05.5	77.7	06.8	78
79	79.0	01.4	78.9	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	79.9	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	80.9	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.4	82.9	02.9	82.9	04.1	82.9	04.4	82.8	05.8	82.7	07.3	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.5	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.2	87.7	07.7	88
89	89.0	01.5	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.9	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	08.0	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.6	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.9	97.6	08.6	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.7	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Point.		87 Deg.		86 Deg.		85 Deg.		

A Table of DIFFERENCE

Dist.	½ Point.		6 Deg.		7 Deg.		8 Deg.		¾ Point.		9 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	04.9	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.8	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.2	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	09.9	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.2	11.9	01.5	11.9	01.7	11.9	01.8	11.8	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.8	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.7	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.2	22.9	02.4	22.8	02.8	22.8	03.2	22.7	03.4	22.7	03.6	23
24	23.9	02.3	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.7	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.6	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.2	28.6	04.5	29
30	29.8	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.4	31.6	04.7	31.6	05.0	32
33	32.8	03.2	32.8	03.4	32.7	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.5	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.3	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.5	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	06.0	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.7	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.7	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.5	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.5	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Dist.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	Dist.
	7½ Point.		84 Deg.		83 Deg.		82 Deg		7¼ Point.		81 Deg.		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg		¾ Point.		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.7	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.6	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.8	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.7	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.3	59.3	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.6	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.6	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.1	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.5	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.2	10.1	68.1	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.6	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.6	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.5	07.1	72.6	07.6	72.4	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.2	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.2	10.7	76.2	11.3	76.0	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.1	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.5	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.5	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.3	84.2	11.8	84.1	12.5	83.9	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.4	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.5	86.1	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.9	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.4	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.8	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.0	13.5	95.9	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	12.0	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		Dist.

Diſt.	10 Deg.		11 Deg		1 Point		12 Deg		13 Deg.		14 Deg.		Diſt.
	Lat	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	02.9	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.1	04.8	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.8	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	01.9	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.5	03.6	15
16	15.7	02.8	15.7	03.0	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	02.9	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.6	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.2	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.4	05.2	24.3	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.1	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.2	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.8	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.5	31.4	06.1	31.4	06.2	31.3	06.6	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.1	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.2	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.0	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.2	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.7	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.7	43.2	08.4	43.1	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	11.0	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.1	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Diſt.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt.
	80 Deg.		79 Deg		7 Point		78 Deg.		77 Deg.		76 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50.2	08.8	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.8	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.3	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.7	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.2	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.5	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.1	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.6	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.0	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.6	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	77.9	18.0	77.6	19.3	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.4	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.2	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.2	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.2	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.5	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	80 Dg.		79 Deg.		7 Point		78 Deg.		77 Deg.		76 Deg.		

2110
59
2169
67
41
26

50
16
66
45
21

Dist.	1¼ Point		15 Deg		16 Deg		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	00.9	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.8	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.	01.5	05.7	01.6	05.8	01.7	05.7	01.7	05.7	01.8	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.6	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.8	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	04.0	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.2	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.5	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.0	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.0	06.6	23.0	06.8	22.9	07.0	22.8	07.4	24
25	24.2	06.0	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	24.9	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	25.9	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.6	28
29	28.1	07.0	28.0	07.5	27.8	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.7	30.9	08.3	30.7	08.8	30.6	09.3	30.6	09.3	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.0	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.3	38.4	11.0	38.3	11.6	38.2	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.3	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.2	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.3	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	12.9	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.6	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.5	15.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	6¾ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		Dist.

Dist.	1¼ Point		15 Deg.		16 Deg.		1½ Point.		17 Deg.		18 Deg.		Dist.
	Lat.	Dep	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.0	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	49.9	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51,6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.8	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.7	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.2	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.1	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.8	16.3	60.5	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.5	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.4	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.2	68.6	18.3	68.2	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.0	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.8	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.1	71.1	20.4	70.8	21.5	[illegible].8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.0	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.3	73.6	22.5	73.2	23.8	77
78	75.7	18.9	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.3	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.8	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.2	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.2	84.2	25.5	84.1	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
9[illegible]	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
9[illegible]	89.2	22.4	88.9	23.8	88.4	25.3	88.0	26.7	88.0	26.9	87.5	28.4	92
[illegible]	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.[illegible]	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	[illegible]6	90.8	27.8	90.3	29.3	95
96	93.1	23.3	92.7	24.8	92.3	26.4	91.9	[illegible]	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	2[illegible]	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28[illegible]	93.7	28.6	93.2	30.3	98
99	96,0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Dist.	Dep	Lat.	Dep.	Lat.	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ Point		75 Deg.		74 Deg		6½ Point		73 Deg.		72 Deg.		

Dist.	19 Deg.		1¾ Point		20 Deg.		21 Deg		22 Deg.		2 Points		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.6	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.7	04.6	01.9	04.6	01.9	5
6	05.7	01.9	05.6	02.0	05.6	02.0	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.0	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.9	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.4	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.3	16.8	06.4	16.7	06.7	16.6	06.8	18
19	18.0	06.1	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.6	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.5	08.2	22.4	08.6	22.2	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.3	27
28	26.5	09.1	26.4	09.4	26.3	09.6	2 .1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.2	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.7	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.2	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.4	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.1	34.8	12.5	34.8	12.6	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.6	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	36.9	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.3	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.6	16.8	44
45	42.6	14.6	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.8	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.6	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	15.9	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.3	45.3	18.7	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		Dist.

Dist.	19 Deg.		1 ¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Dist.
	Lat.	Dep	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.4	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.8	49.0	20.3	53
54	51.1	17.6	50.8	18.2	50.7	18.5	50.4	19.3	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.5	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.3	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.6	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.2	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.5	57.3	20.9	56.9	21.9	56.5	22.8	56.3	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.0	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.6	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.5	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.4	65.0	23.2	54.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.3	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.2	67.7	24.6	67.2	25.8	66.7	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.1	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.3	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	70.9	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	27.9	72.3	29.2	72.0	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.7	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	26.9	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.5	29.4	76.0	30.7	75.7	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	76.9	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.1	28.6	79.9	29.1	79.3	30.5	[illegible]8.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.4	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.7	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.6	82.8	29.6	82.7	30.1	82.1	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.1	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	84.9	32.6	84.4	34.1	84.1	34.8	91
92	87.0	29.9	86.6	31.0	86.4	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	88.0	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	98.9	30.6	88.5	31.7	88.3	32.1	87.7	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.3	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	35.9	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.5	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.3	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Dist.	Dep	Lat.	Dep.	Lat.	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6 ¼ Point		70 Deg		69 Deg.		68 Deg.		6 Point		

Dist.	23 Deg.		24 Deg		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	*Dep*	*Lat.*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.7	03.6	01.8	4
5	04.6	01.9	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.2	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.7	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	05.9	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.6	14.4	07.0	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.4	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.4	18.1	08.5	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.2	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.9	19.6	10.0	22
23	21.2	09.0	21.0	09.3	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.7	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.7	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.8	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.1	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.4	29.4	15.0	33
34	31.3	13.3	31.1	13.8	[illegible]	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	[illegible]	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.4	33.8	15.0	33.5	15.6	33.4	15.8	33.2	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.4	34.4	16.0	34.3	16.2	34.1	16.6	33.9	17.2	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.0	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.2	16.9	36.2	17.1	35.9	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.8	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.2	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		Dist.

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point.		26 Deg		27 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
51	46.9	19.9	46.6	20.7	46.2	21.5	46.1	21.8	45.8	22.3	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.5	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.7	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.0	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.6	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	56.9	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.0	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.7	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.[illegible]	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.2	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.7	68.6	35.0	77
78	71.8	30.5	71.2	31.7	70.7	33.0	70.5	33.3	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.8	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.2	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	[illegible]6.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.7	37.2	79.5	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.4	80.2	40.9	90
91	83.7	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.8	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.4	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.3	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.7	89.9	43.8	89.1	45.4	100
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg		63 Deg.		Dist.

Diſt.	28 Deg.		2½ Point.		29 Deg.		30 Deg.		2¾ Point.		31 Deg.		Diſt.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.6	09.4	05.7	11
12	10.6	05.6	10.6	05.6	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.7	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.4	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.2	15.4	09.3	18
19	16.8	08.9	16.8	08.9	16.6	09.2	16.4	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.1	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.3	19.2	10.7	19.0	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.4	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.8	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.1	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.5	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.2	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.5	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29[illegible]	16.5	29.5	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	3[illegible]	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.4	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.0	33.5	17.9	33.2	18.4	32.9	19.0	32.5	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.1	19.3	35.8	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.1	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.6	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.6	44
45	39.7	21.1	39.7	21.2	39.3	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.1	43.2	23.2	42.8	23.7	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Diſt.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt.
	62 Deg		5½ Point		61 Deg.		60 Deg.		5¼ Point.		59 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point.		31 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26	52
53	46.8	24.9	46.7	25.0	46.3	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.3	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.8	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.7	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.5	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.4	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.0	[illegible]	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.8	32.5	60.3	33.4	59.7	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.3	36.0	61.8	37.0	61.7	37.1	72
73	64.4	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	54.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.1	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	56.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.5	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.7	70.9	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.8	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.1	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	41.9	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.2	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.2	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.6	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	Dist.
	62 Deg.		5½ Point		61 Deg.		60 Deg		5¼ Point		59 Deg.		

Dist.	32 Deg.		33 Deg.		3 Point.		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.3	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.4	04.9	03.4	04.8	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.5	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.1	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.4	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	[illegible]	09.8	13.7	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	15.9	10.1	[illegible]	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.7	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.6	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.0	12.8	18.8	13.2	18.6	13.5	23
24	20.3	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.1	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.5	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.5	23.2	15.6	22[illegible]	16.1	22.6	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17[illegible]	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.3	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.4	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.3	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.3	31.5	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.7	23.9	35.6	24.0	35.2	24.6	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.1	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.4	45
46	39.0	24.4	38.6	25.0	38.2	25.5	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	26.9	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.5	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 Point.		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.2	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.5	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.7	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.7	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.0	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.3	32.7	49.9	33.3	49.7	33.5	49.1	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	34.9	49.3	35.9	61
62	52.6	32.9	52.0	33.8	51.5	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.9	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.5	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.3	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.1	56.6	41.1	70
71	60.2	37.6	59.6	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.0	38.1	60.4	39.2	59.8	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.7	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.8	41.5	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.8	42.8	63.8	43.0	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	68.0	44.1	67.3	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.5	68.0	45.8	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	45.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.8	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	63.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.3	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	72.9	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.7	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.9	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.2	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.6	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.1	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 Points		56 Deg		55 Deg.		54 Deg		

2595
33
2628

38
33.
71
44
27

10-7
12 6
12-7
4 6
26
26
52

4720
1

43
27
70
2646
43
2671

Dist.	3¼ Point		37 Deg.		38 Deg.		39 Deg		3½ Points		40 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.7	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.5	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.1	02.5	03.5	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.6	03.9	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.4	07.4	09.3	07.5	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.1	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.7	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.3	11.6	09.4	11.6	09.5	11.5	09.6	15
16	12.8	09.5	12.8	09.6	12.6	09.8	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.6	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	13.9	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.0	14.5	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.8	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.5	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.4	22.8	17.8	22.1	18.3	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.0	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.6	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.2	27.1	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	27.9	21.1	27.6	21.5	27.2	22.0	27.0	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	27.7	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	29.0	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.5	28.6	38.3	28.9	37.8	29.5	37.8	30.2	37.1	30.4	36.8	30.9	48
49	39.3	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	4¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		Dist.

Dist.	3 ¾ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point.		40 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.3	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.3	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.5	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.3	44.7	33.8	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	33.9	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.8	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.5	47.4	38.4	47.1	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.2	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.5	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.2	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.0	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	55.9	45.3	55.7	45.7	55.1	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.2	46.2	58.3	47.2	58.0	47.6	57.4	48.2	75
76	61.0	45.3	60.7	45.7	60.0	45.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.7	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.2	48.6	61.4	49.7	61.1	50.1	60.5	40.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.[illegible]	50.7	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.6	63.6	53.4	83
84	67.5	50.0	67.1	50.5	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.1	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
85	69.1	51.2	68.7	51.7	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.8	67.2	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.4	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	[illegible]	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.[illegible]	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	[illegible]	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.1	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.7	62.2	75.2	63.0	98
99	79.5	59.0	79.1	59.6	78.0	60.9	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	4 ¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		Dist.

Diſt.	41 Deg.		42 Deg.		3¾ Point.		43 Deg.		44 Deg.		4 Point		Diſt.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	02.9	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.6	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.3	05.9	05.4	05.8	05.5	05.7	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.2	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.1	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.9	11.7	10.6	11.5	11.1	11.3	11.3	16
17	12.8	11.1	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.5	15.5	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.5	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.4	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.4	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.0	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.6	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.6	24.5	22.1	24.4	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.6	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.7	24.1	26.7	24.2	26.3	24.5	25.9	25.0	25.4	25.4	36
37	27.9	24.3	27.5	24.7	27.4	24.8	27.0	25.2	26.6	25.7	26.1	26.1	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.0	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.2	27.3	28.8	27.8	28.3	28.3	40
41	31.0	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.5	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	31.9	28.8	31.9	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.3	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.3	35.3	50
Diſt.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	Diſt.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg		4 Point.		

Dist.	41 Deg		42 Deg.		3¾ Point.		43 Deg.		44 Deg.		4 Points		Dist.
	Lat	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.2	37.3	34.3	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.0	40.9	36.8	40.7	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	38.9	42.4	39.5	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.1	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.8	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.7	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.6	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.5	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.6	47.5	44.3	46.8	45.1	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.3	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.3	48.3	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.9	48.5	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.8	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.1	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.8	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.6	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.3	59.4	59.4	84
85	64.2	55.9	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.7	63.0	58.6	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.7	58.2	64.5	58.4	63.6	59.3	62.6	50.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	55.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.5	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.0	65.0	92
93	70.2	61.0	69.1	62.2	68.9	62.4	68.0	63.4	66.9	64.6	65.8	65.8	93
94	71.0	61.7	69.9	62.9	69.6	63.1	68.7	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.1	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Point		

49-46
50
48.56

62

Th Uſe and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this nature yet extant, giving the Difference of Latitude and Departure, to any Diſtance not exceeding 100, Minutes and Tenth-parts to every Degree and Quarter-point of the Compaſs; and may be uſed to a greater diſtance, being taken out at twice or thrice according to the quantity of the diſtance as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Degree and Quarter-point of the Compaſs; at the head it begins at 1 deg. ſo 2 deg. $\frac{1}{4}$ Point, *&c.* increaſing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, ſo 46 deg. 47 deg. $4\frac{1}{4}$ Points, *&c.* increaſing backwards to 90 deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns under the Title *Diſt.* which on the Left-hand-Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The Uſe of the Table.

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe*,

Examp. 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſails N. N. E. $\frac{3}{4}$ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right-hand Page (becauſe the Diſtance is above 50) and at the top (becauſe it is under 4 Points) look for $2\frac{3}{4}$ Points, which is the Courſe; under which, and againſt 95 the diſtance, and under Title *Lat.* ſtands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Lat. and under the Title *Dep.* ſtands 48.8, which is 48 min. $\frac{8}{10}$ which is the Departure required.

Examp. 2. Suppoſe a Ship ſails South 56 deg. Weſtelry 48 Miles, the Difference of Latitude and Departure required.

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the bottom (becauſe it is above 45 deg.) look for 56 deg. the Courſe; over which and againſt 48 the Diſtance, over the Title *Lat.* ſtands 56.8, that is 56 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8 that is 39 min. $\frac{8}{10}$ the Departure required.

Examp. 3. Suppoſe a Ship ſail North Weſt by North 160 Miles, and the Difference of Latitude and Departure required by the Table.

On the Right-hand Page at the top, look for 3 Points, the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 55.6, tha that is 55 min. $\frac{6}{10}$ the Departure; then for 60 under 3 Points, and againſt 60, under the Title *Lat.* ſtands 49.9, that is 49 min. $\frac{9}{10}$ the Diff. of Latitude, and under the Title *Dep.* ſtands 33.3, that is 33 min. $\frac{3}{10}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, and the Sum is 133 min. the Difference of Latitude, and 88$\frac{2}{10}$ the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plain Sailing*, which for Brevity ſake are omitted here, being taught at large, in the laſt Eddition of *Practical Navigation*; but the general Uſe of it is in the exact working of a Traverſe.

Examp. 1. Suppoſe a Ship bound to a certain Port, ſails S. E. by South, 49 min. then E. S. E. ½ E. 52 min. then E. by N. ½ E. 62 min. then S. S. W. ½ W. 57 min. then South ½ Eaſt 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Lee way if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column, if Southerly, in the South Column; if the Departure be Eaſterly, it muſt be put in the Eaſt Column; if Weſterly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The Table.

Courſes.	*Diſtance.*	*Diff.*	*Lat.*	*Departure.*	
		North	*South*	*Eaſt.*	*Weſt.*
S. E. by S.	49		40.7	27.2	
E. S. E. ½ E	52		15.1	49.7	
E. by N. ½ E.	62	06.1		61.7	
S. S. W. ½ W.	57		50.3		26.9
S. ½ E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The whole Diff. of Latit. is 138$\frac{8}{10}$ S. the Dep. 115 $\frac{5}{10}$ E. then to find the Courſe and Diſt. find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4 and half the Dep. 57.7 the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which, at the Top I find 3½ Points, for the Courſe South Eaſterly, or S. E. ½ S. and in the Column of *Diſt.* 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example

Examp. 2. The Courſes being given in degrees, which often happens by reaſon of allowance for the Variation of the Compaſs, and in the like Caſes.

Suppoſe a Ship bound to a certain Port, ſails 65 Miles North, 34 deg. Weſterly. Then 56 Miles North, 67 degrees Weſterly. Then 48 Miles South, 78 degrees Weſterly. Then 54 Miles North, 23 degrees Eaſterly. Then 36 Miles North, 6 degrees Eaſterly, and the Difference of Latitude and Departure required.

The Table.

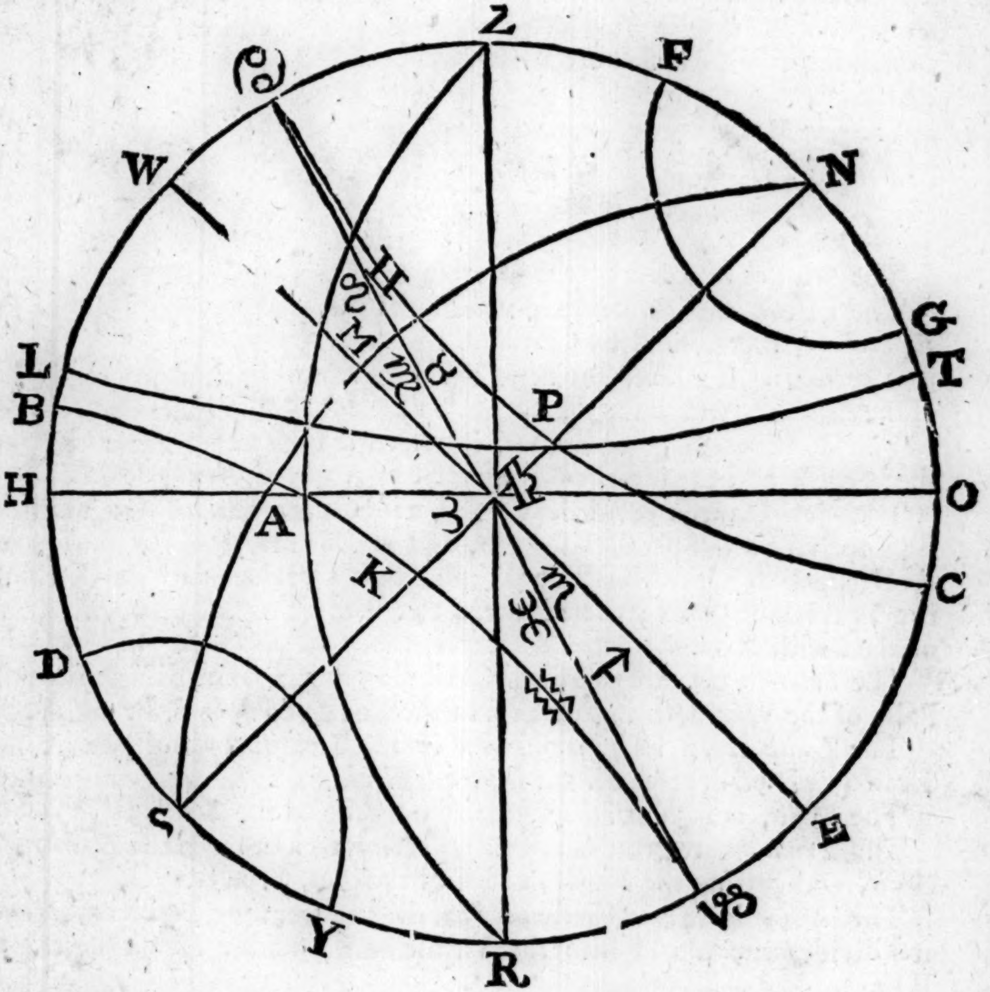
Courſes.		*Diſtance.*	*Diff.*	*Lat.*	*Departure.*	
			North	*South*	*Eaſt.*	*Weſt.*
N. W.	34°	65	53.9			36.
N. W.	67°	56	21.9			51.5
S. W.	78°	48		10.0		47.0
N. E.	23°	54	49.7		21.1	
N. E.	06°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24.9
			151.3			109.9

The whole Difference of Latitude is $151\frac{3}{10}$ North, the Departure $109\frac{9}{10}$ Weſt. The Courſe and Diſtance is found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table*, (according to *Middle Latitude* Sailing) thus: Find the Complement of Middle Latitude in the Degrees, at the top or bottom of the Table, and under or above that in the Column of Departure; find your Departure, and right againſt that, in the Column of Diſtance, you have the Difference of Longitude.

Example. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Lat. 50 deg. 00 min. North; then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and conſequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Colnmn of Dep. I look for the Departure 110, but the Table not proceeding ſo far, I take its half, *viz* 55, the neareſt to which in the Table, is 54.8 (being leſs) againſt which, in the Column of Diſtance is 87, which doubled (becauſe I took half the Departure) the Sum 174 min. or 2° 54′ is the Difference of

Longitude required, which is ſufficiently exact for common Practice; only I would adviſe all Perſons for avoiding as much as poſſible any Errour, that every time the Reckoning is corrected by an Obſervation, the Longitude be alſo corrected according to *Mercator's* Sailing, as you are taught in the laſt Edition of Practical Navigation.



Some neceſſary Aſtronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppoſite one to another; the one viſible to us, called the North Pole, marked with the Letter N; the other not viſible to us, called the South Pole, marked with S.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed the Diurnal Revolution, as the Line N. S.

The *Equinoctial* is a great Circle 90 deg. diſtant from the Poles of the World, and divides it into the North and South Hemiſpheres; it is noted by the Letters E. W.

The *Ecliptick* is a great Circle interſecting the Equinoctial in two oppoſite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 Signs, each containing 30 deg. which are as follows.

Aries	♈	are Northern Signs.	*Libra*	♎	are Southern Signs.
Taurus	♉		*Scorpio*	♏	
Gemenini	♊		*Sagitarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquaries*	♒	
Virgo	♍		*Piſes*	♓	

The *Ecliptick* is noted by the Characters of the Twelve *Signs*.

The Poles of the *Ecliptick* are two Points $23^\circ\ 29'$ from the Poles of the *Equinoctial*, repreſented by G and D.

The Zodiack is a *Zone*, having about 9 degrees of Latitude on either ſide of the *Ecliptick*, and limits the Latitude of the *Planets* in their Revolutions.

The *Meridians* are great Circles, interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as N. M. S.

The *Tropicks*, are two ſmall Circles, 23 deg. 29 min. diſtant from the Equinoctial, being parallel thereto, and are the limits of the *Sun*'s greateſt Declination; the Northern Tropick being marked with ♋ C, called the Tropick of *Cancer*; the Southern called the Tropick of *Capricorn*, and marked with B ♑.

The *Polar-Circles*, are two ſmall Circles, 23 deg. 29 min. diſtant from the Poles of the World, being parallel to the Equinoctial, as F. G. and D. Y.

The Zenith is an imaginary Point in the Heavens, directly over our Head (*viz.*) 90 degrees diſtant from the Horizon, as Z.

The Nadir, is a Point Diametrically oppoſite to the *Zenith*, as R.

The *Azimuths* are great Circles interſecting each other in the *Zenith*, and *Nadir*, and cutting the Horizon at Right angles, Z. A. R.

The *Horizon* is a great Circle 90 deg. diſtant from the *Zenith* and *Nadir*, and divides the World into the Viſible and Inviſible Hemiſpheres, as H O.

The *Meridian* of a Place, is that Meridian that paſſeth by the *Zenith* and the *Nadir* of the ſaid Place, and is repreſented by the Circle Z. H. R. O.

Parallels of *Altitude* or *Almicanters*, are ſmall Circles parrellel to the Horizon, imagined to paſs through any degree of Altitude between the *Horizon* and the *Zenith*, as L. P. T.

Parallels of *Declination*, or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called parallels of *Declination*, with reſpect to the *Sun* or *Stars*, anſt parallels Latitude, reſpecting the Earth, as ♋ P. C.

Circles of Longitude in the Heavens, are great Circles interſecting each other in the Poles of the Ecliptick, and interſecting the Ecliptick at Right angles.

The *Latitude* of a *Star* is an Arch of a Circle of Longitude, contained between the Center of the *Star*, and the Ecliptick, and is accounted either Northerly or Southerly.

The *Longitude* of a *Star*, is an Arch of the Ecliptick, contained between the Circle of Longitude paſſing by the *Star*, and the beginning of *Aries*, and is accounted according to the Succeſſion of the Signs.

The *Declination* of the *Sun* or *Star*, is an Arch of the Meridian, contained between the Center of the *Sun* or *Star*, and the *Equinoctial*, and is accounted either Northerly or Southerly.

The *Right Aſcenſion*, is the Degree and Minute of the *Equinoctial*, that comes to the Meridian with the *Sun* or *Star*.

Oblique Aſcenſion, is the Degree and Minute of the *Equinoctial*, that riſeth with the Center of the *Sun* or *Star*.

Oblique Deſcenſion, is the Degree and Minute of the *Equinoctial*, that ſets with the *Sun* or *Star*.

Aſcenſional Difference, is an Arch of the *Equinoctial*, contained between the Right and Oblique *Deſcenſion* or *Aſcenſion*.

The *Amplitude*, is an Arch of the Horizon, being the diſtance of the riſing or ſetting of the *Sun* or *Star*, from the Eaſt and Weſt, and is accounted either Northerly or Southerly.

The Latitude of a Place, is the height of the Pole above the Horizon, or the diſtance between the *Zenith* and the *Equinoctial*.

Longitude on the Earth, is an Arch of the *Equinoctial*, contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other Place, and is accounted Eaſterly.

Aſtronomical Problems uſeful in Navigation.

PROBLEM I.

THE *Sun*'s Place, and greateſt Declination given, to find its preſent Declination.

Example.

Suppoſe the *Sun*'s Place to be 20° 30′ of *Gemini*, the greateſt Declination is 23° 29′; it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.000000
To S. *Sun*'s greateſt *Declination* 23° 29′	9.600409
So is S. *Sun*'s Diſtance 80° 30′ from *Aries*	9.994003
To S. *Sun*'s preſent *Declin.* required, which is Nor. 23° 9′	19.594412

By the Gunter.

The Extent from Radius S. 90°, to S. 23° 29′, ſhall reach from S. 80° 30′ to the S. 23° 9′, the Declination required.

Note; The *Sun's Diſtance* is reckoned from the next Equinoctial Point, Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquaries*, or *Piſces*, the Diſtance is accounted from *Aries*, but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, or *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs, Conſequently, if the Sun's Place be in any of the firſt ſix, the Declination is Northerly; but if in any of the latter ſix, the Declination is Southerly.

PROB. II.

The Sun's greateſt *Declination* and preſent *Declination* given; to find its Place.

Example.

The Sun's greateſt *Declination* is 23° 29′; the preſent *Declination* ſuppoſe to be 18° 30′ North encreaſing, and the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greateſt Declination 23 deg. 29 min.—9.600409
To Radius ——————————————— 10.000000
So is the S. of the preſent Declination 18° 30′ North ——— 9.501476
To the S. Sun's Place in the Ecliptick required 52° 47′ ——— 9.901067

That is one Sign (30° making a Sign) and 22° 47′ from *Aries*, becauſe the *Declination* is North and encreaſing, that is, 22° 47′ of *Taurus*; but if the *Declination* had been decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7° 13′ in *Leo*.

By the Gunter.

The extent of the Compaſſes from the S. 23° 29′ the greateſt Declination to Radius S. 90° ſhall reach from S. 18° 30′, the Sun's preſent Declination to S. Sun's Place 52° 47′ required.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Suppoſe the Sun's place to be 10° 30′ in *Aquaries*, and the Right Aſcenſion be required.

The Operation by the Logarithms.

As Radius ——————————————— 10·000000
To Tang. of the Sun's Diſtance from *Aries* 49° 30′ ——— 10.068501
So is the Sc. of the greateſt Declination 23° 29′ ——— 9.962453
To Tang of Right Aſcenſion required 47° 2′ ——— 10.030954

By the Gunter.

The Extent from Radius S. 90° to Sc. of the greateſt Declination 66° 31′ ſhall reach from Tang. Sun's diſtance from *Aries* 49° 30′ to Tang. Right Aſcenſion 47° 2′ required.

Note. This Proportion gives the Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succeſſion of the Signs; and therefore in this caſe 47° 2′ ſubtracted from 360°, gives 312° 58′ the Right Aſcenſion required.

PROB. IV.

The Latitude of a *Place*, and the Sun's Declination given to find the Sun's Amplitude.

Example.

Suppoſe the Latitude 51° 32′ North, and the Sun's Declination 15° 20′ North, and the Amplitude required.

The Operation by the Logarithms.

As Sc. of the Latitude 51 d. 32 min. ——— 9.793831

To Radius ——— 10.000000

So is S. of the Declination 15 d. 20 m. North ——— 9.422317

To S. of the Amplitude required which is 25d. 9m. ——— 9.628486

By the Gunter.

The Extent from the Sc. of the Latitude 38d. 28m. to the S. of the Declination 15° 20′ North, ſhall reach from Radius S. 90° to S. Amplitude 25d. 9m. North required.

Note. If the Declination be Northerly, the Amplitude is Northerly; if the Declination be Southerly, the Amplitude is alſo Southerly.

PROB. V.

The Latitude of a Place, and the Sun's Declination given to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51 deg. 32 min. North, the Sun's Declination is 10 deg. 45 min. North, and the Aſcenſional difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51° 52' ——— 9.900085

To Radius ——— 10.000000

So is Tang. of the Sun's Declination 10 d. 45 m. ——— 9.278424

To S. of the Aſcenſional difference. 13° 45′ required. ——— 9.278339

By the Gunter.

The Extent from Tang. 38° 28′ (the Comp. of Latitude) to Tang. 10 deg. 45 min. ſhall reach from Radius S. 90 d. to S. 13 deg. 49 min. required.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, find the Aſcenſional Difference by the fifth Problem.

Secondly, The Right Aſcenſion by the third Problem, Then if the Sun's Declination be Northerly, the Aſcenſional difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, the Oblique Deſcenſion. But if the Sun's Declination be Southerly, the Aſcenſional Difference added to the Right Aſcenſion gives the Oblique Aſcenſion, and ſubtracted gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 deg. and then ſubtract the Aſcenſional Difference therefrom.

Or if both being added together exceed 360*d*. the Exceſs is the Oblique Aſcenſion or Deſcenſion required.

PROB. VII.

To find the Time of the Sun's riſing or ſetting, and length of the Day.

Find the Aſcenſional Difference by the fifth Problem, which converted to Hours and Minutes of Time, accounting for 15 *d*. of the Equinoctial Hour, and for every degree 4 min. of Time, and for every 15 minutes of the Equinoctial 1 minute of Time.

If the Sun's Declination be Northerly, the Aſcenſional Difference added to ſix Hours, gives the Time of Sun-ſetting; and ſubtracted the Time of Sun-riſing.

If the Declination be Southerly, contrarily the Aſcenſional Difference added, gives the Time of Sun-riſing; ſubtracted the Time of ſetting.

The time of Sun-ſetting, doubled, gives the Length of the Day; the time of Sun-riſing, doubled, the Length of the Night.

Example.

In Lat. 51° 32′ North, ſuppoſe the Sun's Declin. 21° 57′ North. h. m.
The *Aſſentional Diff.* is 30° 29′, which reduced, is 2 hours 2 min. *ſere* 6 0
Add 2 2
Time of Sun-ſetting —— 8 2
Time of Sun-riſing —— 3 58
Length of the Day —— 16 4
Length of the Night —— 7 56

PROB. VIII.

The Latitude of the place, the Sun's Altitude and Declination given to find the Azimuth.

Example 1. In the Latitude 51° 32′ North, ſuppoſe the Sun's Declination to be 20° 30′ North, the Altitude 47° 30′, and the Azimuth required.

The Rule.

Take the Compliment of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination to 90 deg. add them together, and take the Half-ſum, ſubtract the Compl. of the Declination from the Half-ſum, and take the Remainder; then ſet down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the Half-ſum and Remainder; half the Sum of theſe four Logarithms, is the Sc. of half the Azimuth required.

Note, If the *Declination* be South in North Lat. or North in South Lat. inſtead of taking the Compl. of the *Declination* to 90 deg. there muſt be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

S. 42	30	Compl. Altitude ——— ——— Comp. Arith.	0.170316
S. 38	28	Compl. Latitude ——— ——— Comp. Arith.	0.206168
69	30	Compl. Declination.	
150	28	Sum.	
S. 75	14	Half ſum ——— ——— ———	9.985413
S. 5	44	Exceſs of the Half-ſum above Compl. Declinat.	8999559
		Sum	19.361456
Sc. 61°	21′	Half-ſum	9.680728
61	21		

Which doubled is 122 42, the Sun's Azimuth from North required.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90 deg. to the S. 42 deg. 30 min. the Compl. of the Altitude, ſhall reach from S. 38 deg. 28 min. the Complement of the Latitude to the S. 24 deg. 40 min. then the extent from S. 24 deg. 40 min. to S. 75 deg. 14 min. the Half-ſum, ſhall reach from S. 5 deg. 44 min. the exceſs of the Half-ſum, above the Complement Declination to 122 deg. 42 min. (upon the Line of verſed Sines) which is the Azimuth required.

Example 2.

In the Latitude 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South the Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms.

S. 72°	15′	Compl. Altitude ——— ——— Comp. Arith.	0.021182
S. 38	28	Compl. Latitude ——— ——— Comp. Arith.	0.206168
108	15	Declination, 90 deg. being added, becauſe South.	
218	58	Sum.	
S. 109	29	Half ſum Complement to 180°, is 70° 31 ———	9.974391
S. 1	14	Remainder ——— ——— ——— ———	8.332924
		Sum	18.534665
Sc. of 29°	20′	——— ——— ——— Half-ſum	9,267332
79	20		

Which doubled is — 158 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90° to the S. 72° 15′ the Complem. Altitude ſhall reach from the S. 38° 28′ the Complement Latitude, to the S. 36° 20′; then the Extent from the S. 36° 20′ to S. 70° 31′ the Complement of 109° 29′ (the Half-ſum) to 180°, ſhall reach from the Remainder S. 1° 14′ to 158° 40′ (upon the Line of verſed Sines) the Azimuth required.

In South Latitude, the Operation is the ſame with the two preceeding Examples, only the Azimuth is found from the South.

After the ſame manner you may find the Azimuth of any Star.

PROB. IX. The Latitude of the Place, the Sun's Declination and Altitude being given to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min North, ſuppoſe the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the Half-ſum, ſubtract the Complement of the Altitude from the Half-ſum, and take the Remainder; then ſet down the Complement Arithmetical of the Sine Complement of the *Declination*, and Complement Latitude, and thereto add the Sines of the Half-ſum and Remainder; half the Sum of theſe four Logarithms, is the Sc. of half the Time required in degrees and minutes of the Equinoctial.

The Operation by the Logarithms.

	°	′			
S.	66	31	Compl. Declination	Compl. Arith.	0.037547
S.	38	28	Compl. Latitude	Compl. Arith.	0.206168
	53	30	Compl. Altitude.		
	158	29	Sum.		
S.	79	14	Half-ſum		9.992286
S.	25	44	Remainder		9.637673
				Sum	19.873674
Sc. of	30	09		Half-ſum	9.936837
	30	09			

Which doubled is 60 18 and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Time required.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ ſubtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time.

If the Declination had been Southerly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the eighth Problem; do the ſame when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compaſſes from Radius S. 90° to S. 69° 31′ the Complement of the *Declination*, ſhall reach from S. 38° 28′ the Complement Latitude, to S. 34° 40′ then the extent from S. 34° 40′ to the S. of 79° 14′, the Half-ſum, ſhall reach from the Remainder S. 25° 34′ to 60° 18′ (upon the Line of verſed Sines) required.

PROB. X. Having the Latitude of the Place the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example,

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of *January* 1720, the Sun's Right Aſcenſion is 20 hours 1 min. the Right Aſcenſion of the *Lyon's Tail* is 11 hours 31 min. the Declination 16 deg. 25 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the hour of the Night required.

The Rule.

Take the Complement of the *Star's* Declination, the Complement of the Latitude of the Place, and the Complement of the *Star's* Altitude; add them together, and take the Half-ſum, ſubtract the Complement of the Altitude from the Half-ſum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the *Star's* Declination, and of the Latitude of the Place, and thereto add the Sines of the Half-ſum and Remainder; half the Sum of theſe four Logarithms, is the Sc. of half the Diſtance from the Meridian.

The Operation by the Logarithms.

	°	′		
S.	73	35.	Compl. Star's Declination —— Comp. Arith.	0.018076
S.	38	28	Compl. Latitude —— Comp. Arith.	0.206168
	59	30	Compl. Star's Altitude.	
	171	33	Sum.	
S.	85	46	Half-ſum ——	9.998813
S.	26	16	Remainder ——	9.645962
			Sum	1.9869019

Sc. of 30° 41′ —— Half-ſum 9.934509

30 41

Which doubled is 61 22 and reduced into Time, gives four Hours five Minutes ½ almoſt ——

By the Direction given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the Fixed Stars, find the Time of the *Star's* coming upon the Meridian, if the *Star* be to the Eaſtward of the Meridian, ſubtract the *Star's* Diſtance from the Meridian in Time, from the Time of the *Star's* coming upon the Meridian, but if the *Star* be to the Weſtward of the Meridian, add the *Star's* Diſtance from the Meridian, to the Time of the *Star's* comingon the Meridian; the Sum or Difference is the Hour of the Night. In this Example, The *Sun's* Right Aſcenſion 20 Hours 1 Minute ſubtracted from the *Stars* Right Aſcenſion (with 24 Hours added thereto) 35 Hours, 31 Minutes; leaves 15 Hours 30 Minutes, the Time of the *Star's* coming on the Meridian from which ſubtracting 4 Hours 5 Minutes, leaves 11 Hours 25 Minutes; the Hour of the Night.

In South Latitude, the Operation is the ſame with the two preceeding Examples, only the Azimuth is found from the South.

After the ſame manner you may find the Azimuth of any Star.

PROB. IX. The Latitude of the Place, the Sun's Declination and Altitude being given to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min North, ſuppoſe the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the Half-ſum, ſubtract the Complement of the Altitude from the Half-ſum, and take the Remainder; then ſet down the Complement Arithmetical of the Sine Complement of the *Declination*, and Complement Latitude, and thereto add the Sines of the Half-ſum and Remainder; half the Sum of theſe four Logarithms, is the Sc. of half the Time required in degrees and minutes of the Equinoctial.

The Operation by the Logarithms.

	°	′		
S.	66	31	Compl. Declination —— Compl. Arith.	0.037547
S.	38	28	Compl. Latitude —— —— Compl. Arith.	0.206168
	53	30	Compl. Altitude.	
	158	29	Sum.	
S.	79	14	Half-ſum ——————	9.992286
S.	25	44	Remainder ——————	9.637673
			Sum	19.873674
Sc. of	30	09	——————Half-ſum	9.936837
	30	09		

Which doubled is 60 18 and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Time required.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ ſubtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time.

If the Declination had been Southerly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the eighth Problem; do the ſame when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compaſſes from Radius S. 90° to S. 69° 31′ the Complement of the *Declination*, ſhall reach from S. 38° 28′ the Complement Latitude, to S. 34° 40′ then the extent from S. 34° 40′ to the S. of 79° 14′, the Half-ſum, ſhall reach from the Remainder S. 25° 34′ to 60° 18′ (upon the Line of verſed Sines) required.

PROB. X. Having the Latitude of the Place the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of *January* 1720, the Sun's Right Aſcenſion is 20 hours 1 min. the Right Aſcenſion of the *Lyon's Tail* is 11 hours 31 min. the Declination 16 deg. 25 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the hour of the Night required.

The Rule.

Take the Complement of the *Star's* Declination, the Complement of the Latitude of the Place, and the Complement of the *Star's* Altitude; add them together, and take the Half-ſum, ſubtract the Complement of the Altitude from the Half-ſum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the *Star's* Declination, and of the Latitude of the Place, and thereto add the Sines of the Half-ſum and Remainder; half the Sum of theſe four Logarithms, is the Sc. of half the Diſtance from the Meridian.

The Operation by the Logarithms.

	°	′		
S.	73	35.	Compl. Star's Declination ——	Comp. Arith. 0.018076
S.	38	28	Compl. Latitude —— ——	Comp. Arith. 0.206168
	59	30	Compl. Star's Altitude.	
	171	33	Sum.	
S.	85	46	Half-ſum —— —— —— ——	9.998813
S.	26	16	Remainder —— —— —— —— ——	9.645962

Sum 1.9869019

Sc. of 30° 41′ —— —— —— —— Half-ſum 9.934509

30 41

Which doubled is 61 22 and reduced into Time, gives four Hours fiveMinutes ½ almoſt ——

By the Direction given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the Fixed Stars, find the Time of the *Star's* coming upon the Meridian, if the *Star* be to the Eaſtward of the Meridian, ſubtract the *Star's* Diſtance from the Meridian in Time, from the Time of the *Star's* coming upon the Meridian, but if the *Star* be to the Weſtward of the Meridian, add the *Star's* Diſtance from the Meridian, to the Time of the *Star's* comingon the Meridian; the Sum or Difference is the Hour of the Night. In this Example, The *Sun's* Right Aſcenſion 20 Hours 1 Minute ſubtracted from the *Stars* Right Aſcenſion (with 24 Hours added thereto) 35 Hours, 31 Minutes; leaves 15 Hours 30 Minutes, the Time of the *Star's* coming on the Meridian from which ſubtracting 4 Hours 5 Minutes, leaves 11 Hours 25 Minutes; the Hour of the Night.

Note further, If the *Star's Declination* be South in North Latitude, or North in South Latitude, inſtead of taking the Complement *Declination* to 90 deg. there muſt be 90 deg. added thereto, as hath been ſhewn in the Eighth proceeding Problem.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90° to the S. of 73 Degrees 35 Minutes the Complement of the Star's Declination, ſhall reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. of 36 Degrees 40 Minutes; then the Extent from S. 36 Degrees 40 Minutes, to S. 85 Degrees 46 Minutes, the Half-ſum ſhall reach from S. 26 Degrees 16 Minutes the Remainder, to 61 Degrees 22 Minutes (upon the Line of verſed Sines) required: With which proceed as hath been directed to find the Hour of the Night.

Courſes and Diſtances between ſome of the moſt Eminent Places on the Coaſt of England, *&c. As alſo the thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South-Coaſt of* England *and* France, *and the Weſt-Coaſt of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth*, N. W. by N.	14
From *Bockneſs* to *Catneſs*, North Weſt	27
From the *North Foreland* to *Fluſhing*, Eaſt	24½
From the *North Foreland* to the *Texel*, North Eaſt	52
From the *Spurn* to the *Texel*, Eaſt by South	56
From *Tinmouth* to the *Naze* of *Norway*, N. E. by E.	120
From *Tinmouth* to *Holy Land*, Eaſt by South	116
From *Tinmouth* to the *Scaw*, E. N. E.	110
From *Yarmouth* to the *Texel*, Eaſt by North	34
From *New-Caſtle* to *Mares-Deep*, E. N. E.	83
From *Aberdeen* to *Mares-Deep*, South Eaſt	113
From the *North Foreland* to the *Maes*, E. N. E.	30
From *New-Caſtle* to the *Fly*, E. S. E.	90
From *Scarborough* to *Holy-Land*, Eaſt Northerly	97
From the *Start* to the *Eddyſtone*, Weſt half South	07
From the *Land's-end* to *Silly*, Weſt by South, South	09
From the *Caſquets* to *Blackneſs*, E. N. E.	56½
From *Beachy* to *Blackneſs*, Eaſt	20

From

From *Dover*, to *Diep*, South	24½
From the *Lizard* to *Guernſey*, E. by S.	40
From the *Start* to *Seven Iſles*, S. by E.	26
From *Silly* to *Uſhant*, S. E. by S.	37
From the *Lizard* to *Uſhant*, South	29
From *Hartland-Point* to the *Iſland* of *Londey*, North	04
From *Londey* to the *Holms*, Eaſt by North	20
From *Black-Rock* to *Tuſcar*, Eaſt North Eaſt	03
From *Cape Clare* to *Old-Head*, Eaſt by North	13
From *Greſholm* to *Waterford*, Weſt by North	21
From the *Land's-end* of *England* to *Tuſcar*, North by Weſt	40
From the *Land's-end* of *England* to *Waterford*, N. N. W.	40
From *Holy-hill* in the Iſland of *Angleſey*, to the Bar of *Dublin*, W. by N.	18½
From *Rockol* to *Black rock*, S. by E.	80
From the *Land's-end* of *England* to *Cape Clare*, N. W. by W.	53
From the *Land's-end* of *England* to *Old-head*, North Weſt	45

A Table of the Soundings coming into the Channel, *reſpecting the Bearings and Diſtance of* Silly, Uſhant, *the* Lizard, *&c. with the various ſorts of Ground.*

	Bearings.	Diſt.	Latit. D.	Latit. M.	Dep.	*The various ſorts of Ground.*
Silly.	South.	05	50	20	50	Branny Sand like Ground Wheat
	S. S. E.	05	50	12	45	White Sand mixed with ſhells
	S. S. E.	06			50	Coarſe Owſe
	E. S. E.	06			53	Coarſe Sand and fine red ſhells
	E. by S.	08	50	12	58	Owſe Sand with Queen ſhells among it
	E. by N.	07	49	15	72	Owſe likeMuſtard-ſeed, with broken ſhells
	E. by N.	15	48	50	72	Pepper-ſand, black and yellow
	E. by N.	25	49	50	72	Black, white and red Stones with Owſe
	E. N. E.	07	49	15	60	Some black Sand
	E. N. E.	20	49	15	80	Rocky Ground
	E. N. E.	55			103	Fine White Sand
	N. E. by E.	22	49	10	85	Sand and Owſe together
	N. E. by E.	10	49	20	55	White and red Sand mixed with ſhells
	N. E. by E.	50	49	50	100	White Sand with Owſe and Nits
	N. E. by E.	25	49	50	64	Branny Sand with white and red ſhells
	N. E. by E.	06	49	10	48	Black Sand
	N. E. by E.	13	49	43	65	Branny Sand with ſome pieces of ſhells

	Bearings.	Diſt.	Lat.		Dep.	*The various Sorts of Ground.*
			D.	M.		
Silly.	North Eaſt	10	49	40	65	Branny ſand, Herring Bones, ſmall ſtones
	N. E. by N.	10	49	20	57	Small red Sand
	N. N. E.	100	49	47	102	White ſand then entring on the Bank
	N. by E.	18			68	Red Sand with black & white *Scollop* ſhells
	North	12	49	15	65	Broken ſhells, with white and red ſand
	North	10	49	47	65	White ſand on the Eaſt part of the Bank
	N. N. W.	33	48	52	77	Red ſand and ſhells amongſt it
	N. W. by N.	07	49	40	54	More ſhells, the *Lizard* N.E. diſt. 18 leag.
	North Weſt	04	50	10	50	Branny ſand, with black and broken ſhells
	North Weſt	07	49	47	60	Stony Ground
	N. W. by W.	04	50	25	61	Red and black ſand, with gliſtering ſhells
	N. W. by W.	2½			44	Shells and ſand like the points of Needles
	W. by N.	13	50	25	63	Fine white ſand, with a little Owſe
	Weſt	21	50	08	66	Red and black ſand, with gliſtering ſhells
	W. by S.	32	49	50	75	Fine white ſand, and gliſtering ſhells
	W. by S.	3½			40	Like broken Wheat or Coarſe Bran
Uſhant.	North	06	48	36	63	Full of ſmall Mace ſand
	N. by E.	18	48	15	80	Round Stones mixed with Scollop ſhells
	N. E. by N.	11			60	Small beaten ſhells and Hakes Teeth
	North Eaſt.	29	48	50	85	Great and ſmall pieces of Cockel ſhells
	North Eaſt.	25	48	10	55	Gray and brown ſand with white ſhells
	N. E. by E.	07	48	30	68	White and Gray Mace ſand
	E. N. E	14	48	36	68	Small ſhells and Herring bones
	E. by N.	25	48	30	85	White and grey ſand with ſmall red ſtones
	Eaſt	18	49	00	70	Branny ſand, ſome ſhells
	Eaſt	06	48	00	65	Red ſand, ſhells, things like Needles points
	Eaſt	15	49	15	70	Fine white ſand
	Eaſt	33	49	15	87	Dazling ſand, like Barley ſtraw
	Eaſt	04	49	10	06	Full of Mace ſand, and broken ſhells
	E. by S.	04	48	56	63	Shells like Perriwinkles
	E. S. E.	15	49	15	70	Shells grey, and red pieces of Cockell ſhells
	E. S. E.	12	49	20	68	Groſs white ſand with ſhells
	E S. E.	08	49	05	64	White ſhells and fine ſmall ſtones
	E S. E.	06			60	Hakes Teeth and ſhells like Oatmeal Huſks
	S. E. by E.	20	49	15	72	Great ſtones like Beans and Peaſe
	S. E. by E.	09	49	15	65	Sand, and ſome ſhells
	S. E. by E.	37	48	30	65	James's ſhells
	S. E. by E.	15	49	25	60	Small Scollop ſhells, with ſmall ſtones

North

	Bearings.	Diſt.	Dep.	*The various Sorts of Ground.*
Lizard.	North Eaſt.	6½	48	Marſhy-ſhells, and ſome Scollop-ſhells.
	N. E. by N.	10	53	Marſhy-ſhells and Hakes Teeth.
	N. N. E.	09	50	Marſhy-ſhells like Oatmeal Husks.
	N. by E.	15	58	Marſhy-ſhells and Hakes Teeth.
	North.	01	39	Stones as big as Beans, ſo four Leagues off.
	North Weſt.	05	45	Gray Sand like Oatmeal Flower.
	North Weſt	03	43	Marſhy ſhells and ſmall ſtones.
	W. N. W.	3½	45	Small ſhingly ſtones, and marſhy-ſhells.
	W. by N.	04	40	White Marſhy-ſhells and white Stones.
	W by S.	30	41	Black gravelly Ground with ſmall ſtones.
	N. E. by E.	12	57	Scollop-ſhells.
	N. E. by E.	04	44	Great Stones and rough Ground.
	North Eaſt.	6½	50	Like Husks of Oatmeal and ſmall ſtones.
Eddyſtone.	N. ½ Mile.		35	Dirty brown ſand and Hakes Teeth.
	W. 2 Miles.		34	Dirty brown ſand.
	S. 1 Mile.		26	Fine ſand, and within this 28 and 30 Fath.
Start.	N. by E. Nly.	8½	40	Like the duſt of a Grindſtone, with Hakes Teeth and ſhells.
	N. W. by W.	4½	43	
	N. W. by N.	03	58	Gravelly ſand, ſmall ſtones and ſhells.
	N. by W. Wly.	12	38	Reddiſh ſhells maſhed, as if beat in a Morter, white ſand and Scollop ſhells.
	N. W. by W.	14	42	
Portland.	N. E. by E.	08	35	Small ſhingly ſtones, as big as Peaſe.
	North.	08	40	Streamy Ground with ſmall ſtones.
	N. by E.	5½	33	The ſame with ſome black ſands.
	N. E. by N.	11	41	Fine ſand and Scollop ſhells.
	N. N. E.	08	40	Fine ſand, ſcollop ſhells and ſmall ſtones.
	N. E. by E.	2½	27	Shingly Ground.
	W. N. W.	2½	20	Small ſtones.
Needles.	N. E. by E.	02	17	Great ſhingly Ground.
	N. E. ½ E.	2½	19	Small ſhingly Ground.
	North Eaſt.	02	13	Rocky Ground.
I. Wight.	N. by W.	3½	20	All the Ground from *Albions* to the Eaſt end of the *Wight* is Chaulky, and brown ſand.
	E. by N.	04	21	
	N. by E.	03	18	
Dunnoſe.	W. by S.	04	16	Rough Ground with ſome big ſtones.
	Weſt.	04	21	A kind of ſandy fiſhing Ground.
	W. N. W.	08	33	Fiſhing Ground ſomewhat red, with ſtones as big as Peaſe, and ſome as Beans.
	N. by W.	06	26	

Directions to ſail into ſome of the Principal Harbours on the Coaſt of *England.*

Directions to ſail into Silly.

SILLY is divided into divers Iſlands; along the Weſt-ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt, called St. *Mary*'s Sound is the beſt, being a fair opening of the Channel; but near the midſt lie two ſunken Rocks, which in foul Weather, the Sea may be ſeen to break over: It is beſt to leave them on the Larboard ſide going in, and on the Starboard coming out: Go ſo near the Starboard-ſhore, as that a Stone may be almoſt thrown on ſhore; and when you are within the point, luff up round, and come to an Anchor in ſight of the Houſes; or when the Town is brought open to the Vally, leave two Thirds of the Harbour on the Larboard-ſide.

To ſail into Foy.

To ſail into *Foy*, it is neceſſary to have at leaſt Half-flood; run in amidſt the Channel between the two Points; and being come within, chuſe either ſide, but the moſt Water is by the Weſt Land, between the *Stakes* and the ſquare Steeple. Being come within the *Stakes*, (as you come in by Land) bear ſomewhat off preſently from the Weſt ſhore, almoſt in the midſt of the Channel neareſt the Weſt ſhore, until you come before the Village that lieth on the Weſt-ſide; where is a deep Dock, in which Ships that draw 16 Foot, may lie a-float at Low-water: four Ships may lie in the ſaid Dock.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis*. In the Entry neareſt the ſaid Weſt-ſide lieth a great Rock above Water, you may ſail in at either ſide of it; at the inner ſide of the Eaſt point lie alſo ſome Rocks off the ſhore; on the Eaſt ſide is deepeſt Water and moſt room, therefore in going in, give the Eaſt Point a large Birth; there will be 7 or 8 Fathom: Keep the ſaid ſhore till you come within St. *Maude*'s Caſtle; which when it bears Eaſt there will be 16 or 17 Fathom; but half the Harbour over towards *Smithick*, it is but 4 or 5 Fathom; Obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth* Caſtle; and ſo it muſt be kept till you ſhut the Church over *Penny-Comquick*, into the North Eaſt end of the *Smithick*, and ſo bear over to St. *Maudes* and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in 4 Fathom, as ſhall ſeem convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth Sound* lieth an high round Rock called *Mewſton*: between it and the *Ramhead* lieth the ſaid *Sound* North North Eaſt being round and deep.

A little to the Northward of *Rambead*, is a fair *Sand Bay*, where is good Anchoring cloſe under the Land, in 9 or 10 Fathom. South a little Eaſterly from *Rambead*, lies a Rock above Water called the *Eddyſtone*, the Point of *Plymouth* lieth from it N. by E. diſtant about four Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas*, or *Drakes-Iſland*, which is faſt to the Weſt ſide, with a Range of Rocks under Water, ſo that you muſt ſail along to the Eaſtward of it.

To Sail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide, in with the Land of *Plymouth*, till *Catwater* open on the Starboard, then go into the Eaſtward between the Point of *Plymouth*, and the Point on the Starboard-ſide, leaving moſt part of the Channel on the Starboard ſide, until you come within the Point, and Anchor there right againſt the high ſteep Northern Land; there is at low Water, with extraordinary Tides, 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the point of the Ledge lies a Buoy, where is about 12 foot Water at Half-flood, which Buoy muſt be left on the *Starboard-ſide* going in; and when *Catwater* is altogether open, you may run in to the Eaſtward, leaving in the Entry of the Harbour two Thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the South-ſhore is ſomewhat flat off, there lying a ſandy Bank, which reacheth to the ſecond Point of the South-ſhoar of *Catwater*.

A little to the Eaſtward of *Drakes-Iſland*, lies a Rock under Water, upon which at Low water, it is not deeper than two Fathom. To ſail within the Land, you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each ſide of the Haven, ſtandeth a little Caſtle; on the Weſt-ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward, run in along by the Weſt-land, ſo far to the Eaſtward until the Key of the Village (on the E. ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands; it is convenient to have a Boat ready (if any guſt of Wind ſhould come from the high Land) to row in: Being come in, edge over to the Weſt ſide before the Brewhouſe, and Anchor there in 10 or 11 Fath. or before the Village, on the Eaſt ſide at Pleaſure. At the Eaſt ſide lieth a ſunken Rock; to avoid which, ſteer in with St. *Patrick's* Church, and do not bring the Village, which ſtandeth on the Weſt ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt ſide of the Chappel always in ſight, without the Bulwarks on the North-ſide by St. *Patrick*'s Church; then there is no danger of the Rock, in the Range by the North-point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

To go into *Torbay*, bring the Weſt point, of the *Berry* S. by E. or S.S.E. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Land-lockt for a S. and S. W. Wind. At the North-eaſt-end of the Bay is alſo a Tide-haven, called the *Tormain*; before it is very good Anchor-ground in 4 or 5 Fathom, according as it is deſired to be nearer or farther from the ſhore.

Directions for Sailing in at the Eaſt End of the Iſle of White *to* Portſmouth-Harbour, *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight*, or *Portſmouth*; after you are come to the Weſtwards of the ſhoal, called the *Owers*, hale in North-Weſt with St. *Hellens* Point; but do not hale too much to the Northwards, for there lies a Bank off of *Longſtone* Haven, to the Eaſtward of the *Horſe*, that hath not above 13 Foot on it at Low water; but keeping in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the S. E. end of the *Sand*, called the *Horſe*, St. *Hellens* Church being S. W. by W. from you, you may run in 5 Fath. and when you have brought the Weſtermoſt great white Parch, or Chalk, upon *Parch-Down* (which is the high Land to the Northwards of *Portſmouth*) a Ship's length to the Weſtward of *South-Sea* Caſtle, that ſtands upon the Beach, then you may luff up without fear: Being then to the Weſtward of the *Horſe*; and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the ſhore, until you come to the Town-wall's end, and there you muſt bear off a little for a *Flat*, that lieth off from the Shore; this is for an Eaſterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire-Beacon on *Brown-Down*, which is to the W. N. W. of *Haſlewood*-point, within a Ship's length without the ſaid Point, then you may bear to the Weſtwards along the out-ſide of the *Spithead*, which is the ſhoal on the Weſt-ſide of the Entrance of *Portſmouth*-Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward and deſign for St. *Hellens* Road, or *Stoaks-bay*; from *Dunnoſe* to *St. Hellens*-point, the Courſe is N.E.by N. and N.N.E. but borrow no nearer to *St. Hellens* than 6 or 7 Fathom, for the *Spit* lies off a great way, but if it be clear Weather, that you may keep *Sand-Down* Caſtle open of the *Culver-Cliff*, that Mark will lead without the *Spit* of the Point; and ſteering along in this Mark, until you open *St. Hellens* Church about two Ships length open of the *Red-Cliff* within *St. Hellens*-point, or *Port-Sea* Caſtle, to the Eaſtwards of *South-Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellens* Road, N. W. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom very good Ground, *Note*, That you have no good clear Ground all along the Iſland until you have opened *St. Hellens* Church, as aforeſaid, and have brought the Point to bear from you S.S.W.

From *St. Hellens* Point, to go between *Noman's Land* and the *Horſe*, the direct Courſe in, is N.W. by N. and N.W. but you have no ſhoaling upon the S.W. ſide of *Noman's Land*, for you have 16 fathom, and the next Caſt but 3; but at the *Horſe* you may ſtand in 10, 9, or 8 Fathom: If the ſtrong Tides be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *Noman's-land*, if it be clear Weather. There are very good Marks to lead you in, which are as follow; Keep the two Windmills on the *Downs* on the *Iſle of Wight*, that they may be ſeen clear over all the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth W.S.W off the Point of *Noman's-land*.

Alſo from *St. Hellens*-point (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a Piece of an old Caſtle heretofore called *Haſlewood* Caſtle, ſtanding on *Gilkeker* Point (which of late is kept white;) keep *Goſport* Church and that both in one, or this Mark in the middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without Fear. Or if the Wind be ſo that you are forced to turn it in, then you may turn the ſaid Mark within two ſails breadth of each end of the Wood. In the middle of the Channel is 18 Fathom Water; and if you bring the ſaid Mark right under the North end of the Wood, you ſhall run in a middle Ground near the *Horſe*, that hath not above 10 Foot on it at Low-water, and hard ſand.

To ſail within the Wight *in thick Weather.*

To ſail between the *Main* and the *Wight* in thick Weather; borrow in 6 Fathom of *St. Hellens*, and ſteer N.W. by N. and N.N.W, from *St. Hellens*-Point, till you have 12 Fath. and then ſteer more Weſterly, as you find the Depth; come no nearer *Noman's land* than 9 or 10 Fath. in that depth you may keep along the *Wight*-ſide, if the Wind be Southerly, but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both ſides, and ſo ſteer *W.* by *S.* and *W.S.W.* as you find the Depth until you come to *Cows*. *Note*, that being about *Stoaks*-bay, there will be leſs Water; if you go nearer to *Cows*, there you may anchor in 12 or 14 Fath in the midſt of the Channel, where is good Owſey Ground.

Directions for Dover Road.

The beſt Ground in *Dover Road* is with the *White-way*, to the N.W. of *Dover-Caſtle*, or between that Hill that comes from St. *James's* Church, which is a flat Steeple at the North end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 7 to 14 Fathom. Thwart of *Foulſtone* in 12 or 14 Fathom is very good Ground.

Directions to ſail into the North-Foreland *through the* Gulls *in the Night.*

If the Ground Tackle ſhould fail in the Night, riding at the *North Foreland*, as very often has happened, and you cannot weather the *Foreland*, weather the *Northſand-head*; if you can but ſee the *North-Foreland* Light, when that Light-houſe bears *N. W.* or *N. W.* by *N.* then bear over into 8 or 9 Fathom, and being in that Depth (ſteering to the S.ward S. S. W.) you may be ſure it will carry you directly thro' with the *Brake*: but keeping your Lead carefully, and burrowing no nearer the *Brake* than 5 Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North-end of the Goodwin, *for ſuch as ſail from the* North-Foreland, *to the Southward in the Night.*

If you be at *North Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late, to turn into the *Downs* with the Wind at S. W. or *S.S.W.* take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient time, to be at the *North-ſand head* at the turning of the Tide, to the Southward. From the *Foreland* you may ſteer out with a Flood-Tide, S. E. by E. and S. E. or keep the Light of the *North-Foreland* N.W. by N. this Courſe will lead you out. But for the more certainty, be ſure keep the Lead well, and then you may burrow off and on with the aforeſaid Winds, in 7 or 8 Fathom; and ſteering out with the aforeſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 fathom; then you may hale up cloſe to the Southward along the back of the *Goodwin*, the Eaſtermoſt ſide of which lies S.S.W. and N.N.E. 12 or 14 fathom; and is not above a ſaker ſhot from the ſand. But if it be in the Day-time, and the Wind blows ſo hard that you cannot well tack to turn through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is the flat Church upon the *Foreland*, call'd St. *Peters*, a ſhip's length to the Northwards of *Broad-ſtairs* Peer head; or burrow upon the ſand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the ſand, you may ſtand to the South Eaſtwards, till the *South Foreland* bears W. by S. then caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Downs* Road before any other ſhip that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin* or *Kings Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits* the Buoy lieth in 5, 6, and 7 foot Water, at Low-water; and the Paſſage often alters, ſometimes more Water ſometimes leſs. The Buoy lieth on the Weſt-end of the *Gunfleet* Sand, and the Eaſt-end of the *Buxey*, bearing from a flat Steeple, called *Great Holland Church*, South and by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, ſix, ſeven and eight fathom Water; the Sands lying without, makes it a moſt excellent Road. There is a good and deep

Channel to ſail in at the *Wallet*, between the *Gunfleet* and the *Weſt* Rocks, but 'tis ſeldom uſed. Being over the *Spits*, into the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a houſe that ſtandeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the ſtone Bank which hath but 5 foot Water on it at Low-water; and lieth from the *Naze* Trees E. by N. About a Mile and a half from the *Naze* Point there is but 8 or 9 foot Water between it and the *Naze* at Low water; keep *Payn's* Trees which lie a little to the Southward of *Harwich*, open and ſhut with *Harwich Cliff*, and this Mark will carry you on the ſtone Banks, and the Trees on the *Corkland*, juſt open of the *Nazeland*, will carry you on the Bank alſo. There is a good leading Mark to carry you between the *Naze*, and the ſtone Bank, which is *Harwich* ſteeple, on *Harwich* Beacon Cliff; and will alſo carry you between the *Pye-ſand* and the Ridge in the *Rowling-Ground*, where ſhips Anchor in 3 and 4 fathom at Low-water. The Mark to Anchor in the beſt of the *Rowling Ground*, is to bring *Harwich Windmill* 2 Sails breadth open of *Harwich Cliff*: And to ſail from the *Rowling Ground* to the *Naze*, keep *Payn's* Trees open of *Harwich Cliff*, till you bring the *Naze* to bear S.W. then keep *Harwich* ſteeple on the Beacon *Cliff*, to run within the ſtone Bank. There is a Channel to ſail from the *Naze* between the Cork ſand and the Ridge, keeping the *Naze* Trees S.W. ſailing down N.E. between the Cork and the Ridge, in 5, 6 and 7 fathom Water: And when you have brought *Harwich* ſteeple on the Brewhoſue that lieth to the Northward of *Languard Fort*, then are you clear of the Cork Lege; this Channel is much uſed by Light *Colliers* going to the Northwards.

Being in the *Rowling Grounds*, and that you will ſail into *Harwich* Harbour, keep cloſe by the *Andrews*, which is a ſand that lieth off from *Languard* Fort, and is ſteep too on the weſt ſide; at the Tide of Ebb runneth ſtrong over the *Andrews*, the firſt half Ebb, of which you muſt have a care; This ſand is dry at Low-water; keep cloſe by the Beach of *Languard* Fort, to avoid the *Alter*, which is a ſmall ſtony ſhelf that lieth right Weſt from *Languard* Fort, about a Cable and a half's length from the Beach at the Fort, on which is but 5 and 6 foot at Low-water. You may ſail to the Weſtward of it, between it and *Harwich Cliff*, according as the Tide is up, and what Draught of Water your Ship draweth: But if you ſhould chance to go into *Harwich* at Low-water, and your ſhip draw above 15 foot, you muſt ſtay for the flood to have Water over the *Glutton*, which is a narrow Ridge, and ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard* Fort: Being paſt the *Glutton*, you muſt keep cloſe to the *Beach*, to avoid the Griſtle that lieth in the middle between *Harwich* and the *Beach* of *Languard* Fort, on which is but three foot at Low-water, there is a ſmall Channel between the Griſtle and the Guard of 9 foot at Low water; but when you have opened *Dover* Court-Church of *Harwich* Town, then are you clear of the Griſtle and the Guard, and may Anchor before the Town of *Harwich*, in 5 fathom Water, or run into *Ipſwich* Water, and Anchor; this is a very ſafe Harbour, and if a ſhip ſhould chance to blow a ſhore ſhe cannot take harm, the ſhoars being ſoft Owſe. The Spring Tides riſes 15 and 16 foot, and the Neap-Tides 10 and 11 foot.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and that you will not ſail over the *Spits*, then keep down by the *Gunfleet-ſand* in 7 and 8 fath. Water, till you come within 2 Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 fathom Water, for there lieth off a *Spit*, E.S.E. from the ſand about a Cable's length; to the Eaſtward of this *Spit*, is a ſmall Swatch through the *Sand*, into which, and *Goldmores Gat*, the Tide of flood ſetteth ſtrong into the *Wallet*, of which you muſt have a care when you come near it, eſpecially in little Winds or Calms, you may be haled on the *Gunfleet-ſand*; this Sand lieth N.E. and S.W. and drieth in ſeveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* S.E. by E. Eaſterly; you may ſtand into 7 or 8 fath. along the ſide of the Weſt Rocks into the *Sledway*, keeping *Balſey* Church N. by W. and N.N.W. till you bring *Harwich* ſteeple on the Brew-houſe, (that lieth to the Northward of *Languard* Fort) which will carry you clear of the Cork Ledge, on which is two fathom and a half at Low-water, and then ſtand to the Weſtward, and keep *Orford*-Church and Caſtle open of *Balſey* Cliff a Sails breadth till you have the Lights together, keeping them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*: You muſt ſtand in upon the *Platters* into 5 fathom, on which *Sand* is but 2 or 3 foot at Low-water; the Ridge hath 7 foot at Low-water; a great part of the Cork ſand drieth at Low-water; and lieth in length N.E. and S.W. about 2 Miles and a half long, and a Mile broad; Weſt Rocks lie in length N.E. and S.W. about 3 Miles, and 2 Miles broad, and drieth in ſeveral Places full of Banks and Swatches, the Ground rocky and ſtony, in many Places there is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For more particular Directions for ſailing into theſe and other Harbours in *England*, *Scotland*, *Holland*, *Normandy*, *Bretaigne*, &c. ſee the laſt Edition of the Coaſting Pilot, newly Corrected and Reprinted for Mr. *Mount*, on *Great Tower-hill*, London: With many Additions.

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